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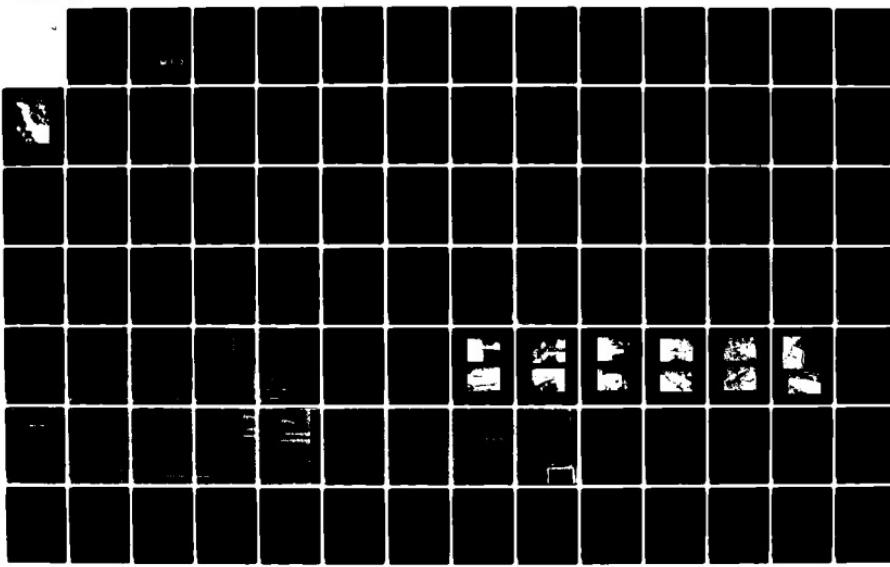
NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS
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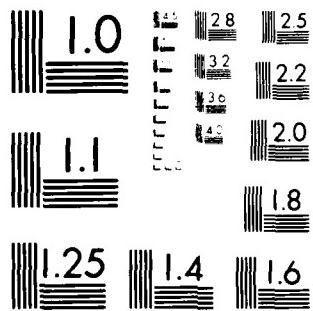
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SOUTHWESTERN COASTAL BASIN
GREENWICH, CONNECTICUT

AD-A142 685

MIANUS FILTER PLANT DAM
CT 00040

PHASE 1 INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

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DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASS.

FEBRUARY, 1980

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number) The dam at the Mianus Filter Plant is a stone masonry dam built in the 1870's and is a source of water supply for the surrounding area. The water treatment facility was renovated in 1954. The dam is approx. 130 ft. long, 31 ft. high and has a top width of 7 ft. The outlet works for the dam consist of a 65 ft. long spillway, a 30 inch supply main to the water treatment facility, a low level blowoff, and two 4 ft. wide by 5 ft. high flood control gates.		



DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION. CORPS OF ENGINEERS
424 TRAPELO ROAD
WALTHAM, MASSACHUSETTS 02154

REPLY TO
ATTENTION OF
NEDED

MAR 21 1980

Honorable Ella T. Grasso
Governor of the State of Connecticut
State Capitol
Hartford, Connecticut 06115

Dear Governor Grasso:

Inclosed is a copy of the Mianus Filter Plant Dam Phase I Inspection Report, which was prepared under the National Program for Inspection of Non-Federal Dams. This report is presented for your use and is based upon a visual inspection, a review of the past performance and a brief hydrological study of the dam. A brief assessment is included at the beginning of the report. I have approved the report and support the findings and recommendations described in Section 7 and ask that you keep me informed of the actions taken to implement them. This follow-up action is a vitally important part of this program.

A copy of this report has been forwarded to the Department of Environmental Protection, the cooperating agency for the State of Connecticut. In addition, a copy of the report has also been furnished the owner, Connecticut American Water Company, Greenwich, Connecticut.

Copies of this report will be made available to the public, upon request, by this office under the Freedom of Information Act. In the case of this report the release date will be thirty days from the date of this letter.

I wish to take this opportunity to thank you and the Department of Environmental Protection for your cooperation in carrying out this program.

Sincerely,

MAX B. SCHEIDER
Colonel, Corps of Engineers
Division Engineer

Incl
As stated

**SOUTHWESTERN COASTAL BASIN
GREENWICH, CONNECTICUT**

MIANUS FILTER PLANT DAM

CT 00040

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PHASE I INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM

NATIONAL DAM INSPECTION PROGRAM

PHASE I - INSPECTION REPORT

Identification No.:	CT 00040
Name of Dam:	Mianus Filter Plant Dam
Town:	Greenwich, Connecticut
County and State:	Fairfield County, Connecticut
Stream:	Mianus River
Date of Inspection:	November 13, 1979

BRIEF ASSESSMENT

The dam at the Mianus Filter Plant is a stone masonry dam built in the 1870s and is a source of water supply for the surrounding area. The water treatment facility was renovated in 1954. The dam is approximately 130 feet long, 31 feet high and has a top width of 7 feet. The outlet works for the dam consist of a 65 foot long spillway, a 30 inch supply main to the water treatment facility, a low level blowoff, and two 4 foot wide by 5 foot high flood control gates.

Based on the visual inspection, the review of the 1954 renovation plans and past operational performance, the dam is judged to be in FAIR condition. However, there is a concern about the seepage zone at the downstream face of the dam, which requires further study.

The dam is classified as **SMALL** in size and a **HIGH** hazard potential structure in accordance with recommended guidelines established by the Corps of Engineers. The test flood for this dam is 1/2 the Probable Maximum Flood (PMF). The test flood has an outflow discharge equal to 14100 cfs and will overtop the dam in a stillwater condition. The maximum outflow capacity of the spillway under stillwater condition is 680 cfs which represents approximately 5 percent of the test flood.

It is recommended that the owner take the following actions: Monitor the seepage on the downstream face, remove the trees from the upstream channel bed and develop and implement a formal emergency warning system.

Recommendations and remedial measures that should be implemented by the Owner within one year period after receipt of this Phase I Inspection Report, are further described in Section 7.

JAMES P. PURCELL ASSOCIATES, INC.

Sudhir A. Shah

Sudhir A. Shah, P.E.
Vice-President
Connecticut P.E. No. 8012



This Phase I Inspection Report on Mianus Filter Plant Dam has been reviewed by the undersigned Review Board members. In our opinion, the reported findings, conclusions, and recommendations are consistent with the Recommended Guidelines for Safety Inspection of Dams, and with good engineering judgment and practice, and is hereby submitted for approval.

Carney M. Terzian

CARNEY M. TERZIAN, MEMBER
Design Branch
Engineering Division

Richard J. DiBuono

RICHARD DIBUONO, MEMBER
Water Control Branch
Engineering Division

Armand Mahtesian

ARAMAST MAHTESIAN, CHAIRMAN
Foundation & Materials Branch
Engineering Division

APPROVAL RECOMMENDED:

Joe B. Fryar
JOE B. FRYAR
Chief, Engineering Division

PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I Investigation. However, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there by any chance that unsafe conditions be detected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the spillway test flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the test flood should not be interpreted as necessarily posing a highly inadequate condition. The test flood provides a measure of relative need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and downstream damage potential.

The Phase I Investigation does not include an assessment of the need for fences, gates, no-trespassing signs, repairs to existing fences and railings and other items which may be needed to minimize trespass and provide greater security for the facility and safety to the public. An evaluation of the project for compliance with OSHA rules and regulations is also excluded.

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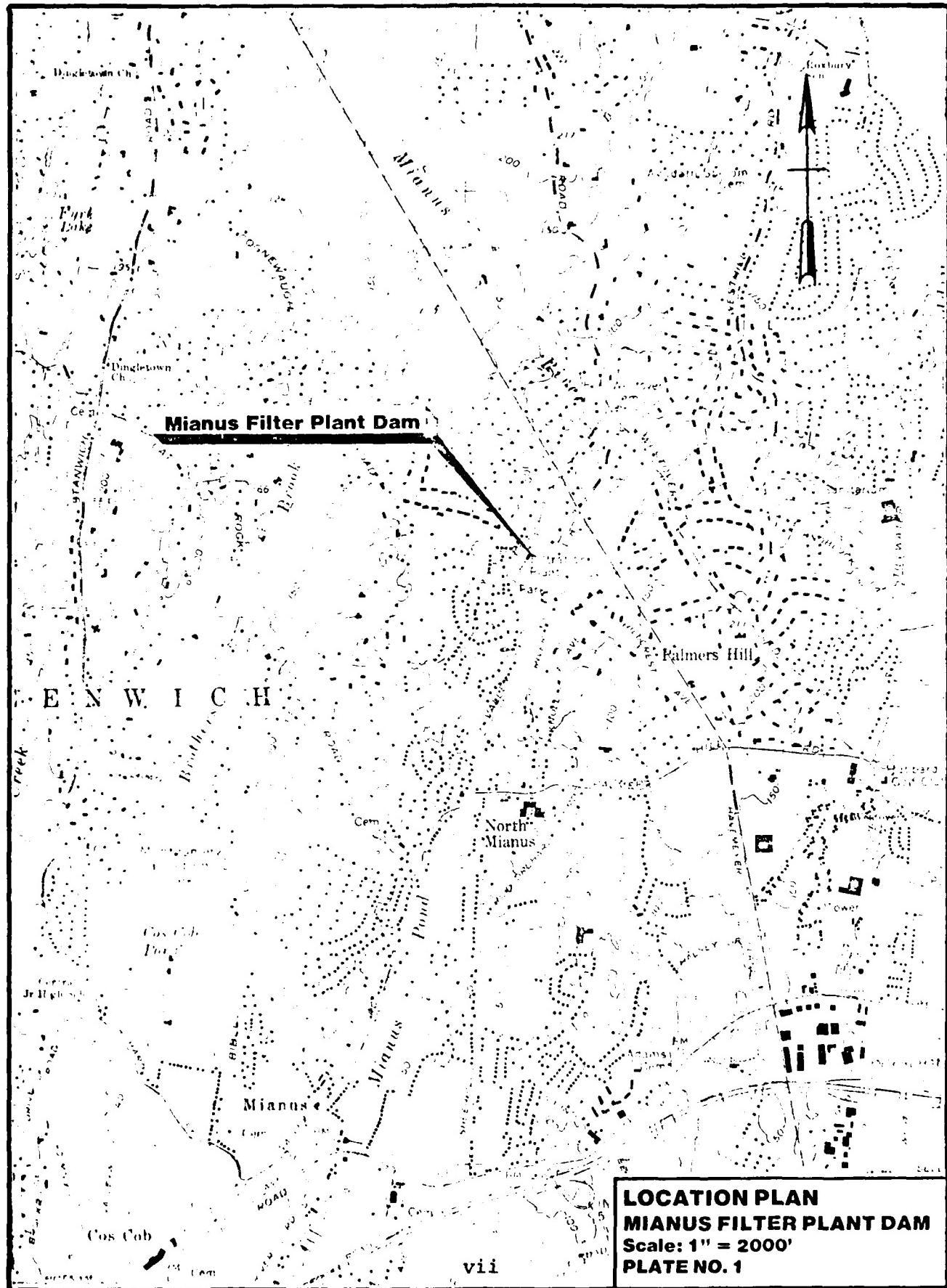
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NATIONAL DAM INSPECTION PROGRAM

PHASE I - INSPECTION REPORT

NAME OF DAM: MIANUS FILTER PLANT DAM

SECTION 1

PROJECT INFORMATION

1.1 General

a. **Authority:** Public Law 92-367, August 8, 1972, authorized the Secretary of the Army through the Corps of Engineers to initiate a national program of dam inspection throughout the United States. The New England Division of the Corps of Engineers has been assigned the responsibility of supervising the inspection of dams within the New England Region. James P. Purcell Associates, Inc. has been retained by the New England Division to inspect and report on selected dams in the State of Connecticut. Authorization and notice to proceed was issued to James P. Purcell Associates, Inc., under a letter from William E. Hodgson, Jr., Colonel, Corps of Engineers. Contract No. DACW33-80-C-0002 has been assigned by the Corps of Engineers for this work.

b. **Purpose of Inspection**

1. Perform technical inspection and evaluation of non-Federal dams to identify conditions which threaten the public safety and thus permit correction in a timely manner by non-Federal interests.
2. Encourage and prepare the States to initiate quickly, effective dam safety programs for non-Federal dams.
3. To update, verify and complete the National Inventory of Dams.

1.2 Description of Project

a. **Location:** Mianus Filter Plant Dam is located in Fairfield County, Connecticut, approximately 0.8 miles north of North Mianus, Connecticut. The dam impounds water from the Mianus River and is located approximately 4000 feet upstream of Mianus Pond and the Village of North Mianus.

The impoundment is situated in a north/south direction, with the dam located at the southern end. Latitude 41° -04'-06", longitude 73° -34'-42".

All elevations used in this report are based on the Greenwich Water Company Datum (GWCD) unless noted. The datum is 7.29 feet above the U. S. Coast and Geodetic Survey mean low water datum.

- b. **Description of Dam and Appurtenances:** This dam impounds water from the Mianus River which is processed through the filtration plant and distributed to many customers in the surrounding area. The dam itself consists of stone masonry body and was believed to have been built approximately 100 years ago.

The outlet works for the dam consist of the following: A 30 inch pipe, controlled by a lift mechanism on the dam's west crest, for water supply to the filters; a low level blowoff controlled by a lift mechanism on the dam's west crest; two high level flood gates on the dam's east crest; and a 65 foot spillway.

The dam creates a narrow impoundment by flooding a portion of the natural valley of the Mianus River.

- c. **Size Classification:** The size classification of this dam is SMALL as per the criteria set forth in Recommended Guidelines for Safety Inspection of Dams by the Corps of Engineers. The impoundment storage at the top of the dam is 118 ac-ft (with the range 50 to 1000 ac-ft), and the maximum height of the dam is 31 feet (within the range 25 to 40 feet). The size classification is based on both the height and storage criteria.
- d. **Hazard Classification:** The hazard classification of this dam is HIGH as per the criteria set forth in Recommended Guidelines for Safety Inspection of Dams by the Corps of Engineers. Failure discharge can result in the loss of more than a few lives, and cause damage to residential structures along the downstream channel; and loss of the water supply would impose hardships on the service area. The estimated water depth due to a dam failure may range from 9.0 feet at the dam to 4.5 feet at Mianus Pond.
- e. **Ownership:** This dam is owned and operated by the Connecticut American Water Company.
- f. **Operator:** The person in charge of the day-to-day maintenance of the dam as well as the adjacent water treatment plant is:

Mr. William McCormick, Superintendent
Connecticut American Water Company
125 East Putnam Avenue
Greenwich, Connecticut 06830
Tel. (203) 869-5200
(203) 661-7200

- g. **Purpose:** This dam impounds water from the Mianus River that is used to supply drinking water to approximately 13,000 customers in the surrounding area.
- h. **Design and Construction History:** The original dam was built in the 1870s. However, there are no documents available to support either the design or construction. In the 1950s when the filter plant was renovated, modifications to the blowoff system and intake piping were made, and this involved some construction to the body of the dam. It is not clear just what work was done to the dam body to make these renovations. During this renovation period the retaining walls along the downstream channel were built to accommodate the new plant facility.
- i. **Normal Operational Procedure:** The operating procedure for controlling the water level of the dam's pond is governed primarily by the water supply demands of the treatment plant. The emergency blowoff valves and flood gates are rarely used, because in the case of a storm emergency the gates would handle such a relatively small amount of the flow. An agreement with adjacent property owners requires a flow of one MGD to be discharged downstream and, therefore, a 4 inch gate valve at the flood gates is maintained in an open position.

1.3 Pertinent Data

- a. **Drainage Area:** Mianus Filter Plant Dam is located in Fairfield County, Connecticut. The dam lies just north of North Mianus, approximately 0.8 miles. The basin is generally rectangular in shape with a length of 11.9 miles and an average width of 4 miles, resulting in a total drainage area of 29.9 square miles. (See Drainage Basin Map in Appendix D). The topography is generally rolling to moderate terrain, with elevations ranging from a high of 810 to 69.65 at the spillway crest. Stream and basin slopes are flat to moderate, having average grades of 0.5 percent to 2.0 percent, respectively. The normal water surface area is 7.2 acres which is approximately 0.04 percent of the watershed.
- b. **Discharge at Dam Site:** Daily spillway discharge records are available from the Connecticut American Water Company. Listed below are calculated discharge values for the spillway and outlet works.

1. **Outlet Works:** A low level blowoff with an intake approximately at elevation 44.5 and a discharge capacity of 74 cfs at an elevation of 69.65, the spillway crest. Twin 4 foot wide by 5 foot high flood gates with an invert at elevation 65.15 and a discharge capacity of 206 cfs with water at the spillway crest level.
2. **Maximum known flood at dam site:** Recorded on June 19, 1972 to be in excess of 310 cfs (upper limit of flow recorder).
3. **Spillway capacity at top of dam:** 680 cfs at elevation 72.15 (east side).
4. **Spillway capacity at test flood:** 7650 cfs at elevation 82.2.
5. **Gated outlet capacity at normal pool elevation:** 74 cfs (blowoff) and 206 cfs (flood gates) at elevation 69.65.
6. **Gated outlet capacity at test flood elevation:** 92 cfs (blowoff) and 850 cfs (flood gates) at elevation 82.20.
7. **Gated outlet capacity at top of dam elevation:** 80 cfs (blowoff) and 410 (flood gates) at elevation 72.15.
8. **Total project discharge at top of dam:** 1,170 cfs at elevation 72.15 (east side).
9. **Total project discharge at test flood elevation:** 8590 cfs at elevation 82.20

c. **Elevation (Feet above GWCD)**

- | | |
|---------------------------------------|---------|
| 1. Streambed at toe of dam | 41.6 |
| 2. Bottom of cutoff | Unknown |
| 3. Maximum tailwater | Unknown |
| 4. Recreation pool | N/A |
| 5. Full flood control pool | N/A |
| 6. Spillway crest | 69.65 |
| 7. Design surcharge (Original Design) | Unknown |

8.	Top of dam	72.15 east, 74.70 west
9.	Test flood level	82.20
d. Reservoir (Length in feet)		
1.	Normal pool	1000
2.	Flood control pool	N/A
3.	Spillway crest pool	1000
4.	Top of dam	1000
5.	Test flood pool	2500
e. Storage (acre-feet)		
1.	Normal pool	101
2.	Flood control pool	N/A
3.	Spillway crest pool	101
4.	Top of dam	118
5.	Test flood pool	419
f. Reservoir Surface (acres)		
1.	Normal pool	7.2
2.	Flood control pool	N/A
3.	Spillway crest	7.2
4.	Test flood pool	60+
5.	Top of dam	7.6
g. Dam		
1.	Type	Stone masonry

2.	Length	130 feet
3.	Height	28 feet at spillway
4.	Top Width	7 feet
5.	Side Slopes	Upstream: 1H:10V Downstream: 1H:10V
6.	Zoning	Unknown
7.	Impervious Core	Unknown
8.	Cutoff	Unknown
9.	Grout curtain	Unknown
10.	Other	Concrete weir located downstream
h. Diversion and Regulating Tunnel		N/A
i. Spillway		
1.	Type	Overflow, broad crested, uncontrolled weir
2.	Length of weir	65 feet
3.	Crest elevation	69.65
4.	Gates	None
5.	U/S Channel	Natural Bed
6.	D/S Channel	Stone retaining wall on right side extending 500 ft. downstream of dam. Channel and left bank are natural.
j. Regulating Outlets: Refer to Paragraph 1.2b "Description of Dam and Appurtenances" for description of outlet works.		

1. 30 inch cast iron supply main, intake at elevation 49.75, sluice gate controlled by lift mechanism on top of dam.
2. Low level blowoff, intake at elevation 44.5, 24 inch sluice gate controlled by lift mechanism on top of dam.
3. Two 4 foot wide by 5 foot high flood gates, intakes at elevation 65.15, controlled by lift mechanisms on top of dam.

SECTION 2

ENGINEERING DATA

2.1 Design

There is no formal design data available for the dam both in terms of stability analysis or spillway capacity. Available design data consists of plans of the 1954 renovations to the sluice gates and water treatment facilities.

2.2 Construction

The years of construction appear to have been in the 1870s, although the exact date is unknown. Review of the contract plans for the 1954 renovation showed that the modifications to the body of the dam appear to be limited to the supply pipes and flood gates. The retaining walls in the downstream channel were also repaired. However, no records or photographs were available of this work.

2.3 Operation

The operation of the dam is for the purpose of water supply, and, therefore, the water level for this dam is established on the basis of the water supply demand. However, there is no written procedure that has been established for this purpose.

2.4 Evaluation

- a. **Availability:** The information concerning this dam was gathered only by field investigation and meetings with officials of the Connecticut American Water Company.
- b. **Adequacy:** The lack of in depth engineering did not allow a definitive review. Therefore, the adequacy of this dam could not be assessed from the standpoint of reviewing design and construction data, but is based primarily on the visual inspection, the dam's past performance, and sound engineering judgment.
- c. **Validity:** The validity of the limited information available must be verified.

SECTION 3

VISUAL INSPECTION

3.1 Findings

- a. **General:** The visual inspection was conducted on November 13, 1979 and a copy of the visual inspection check list is contained in Appendix A of this report. The following procedure was used:
 1. Inspection of the upstream area of the river which was impounded by the dam.
 2. Visual survey of the face of the dam and spillway for cracks, loose stones, etc.
 3. Review of the condition of the top of the dam for cracking, spalling or loose stones.
 4. Survey of the process used by the water treatment plant as well as emergency procedures that could be used.
 5. Check of the downstream area for seepage, piping, boils, or other distressed areas.
 6. Photographs of the general area of the dam and of specific items of note were taken during the inspection, and are contained in Appendix C of this report.

Before the inspection, the design and construction documents and aerial photographs were studied and reviewed.

b. Dam

1. **Crest:** The top of the dam is constructed of granite stone and shows no evidence of settlement or misalignment. Grass is growing from joints on the east side. A concrete capped stone block platform, just upstream of the dam's west crest supports the lift mechanisms for the supply main and the blowoff (Photo C-7).
2. **Upstream Slope:** The upstream slope is stone masonry with a nearly vertical face above the water level. The joints are in a deteriorated condition. The flood gates are on the upstream face on the east side of the dam (Photo C-5).

3. **Downstream Slope:** The downstream slope is also stone masonry with a nearly vertical face. There are numerous places where seepage is steady on the face of each abutment (Photos C-8, 9). The condition of the joints is quite poor (Photo C-9) and one joint on the west abutment has a void which measures 18 inches deep (Photo C-10). A few loose stones were noted on the east abutment and grass was growing from some of the joints. The fill on the downstream face of the west abutment seemed to be quite moist, indicating that seepage occurs below grade as well as above.

c. **Appurtenant Structures**

1. **Spillway:** The spillway for the dam is a 65 foot long stone capped weir with a free drop of approximately 28 feet to the tailwater (Photos C-2, 4). The water level on the day of inspection was 30 inches below the east top of the dam and water was flowing over the spillway. The spillway appears to be in generally good condition.
 2. **30 Inch Supply Main:** This pipe extends from a sluice gate inlet below the west top of the dam to the filters located downstream on the west bank. The lift mechanism, located on the dam's west crest is reportedly operable (Photo C-7). A 20 inch and a 6 inch blowoff to the river (Photo 12) is located off the 30 inch pipe in a covered valve chamber on the west bank downstream of the dam. The valves for the blowoffs are hydraulically controlled from inside the filter plant building but have not been operated for at least 6 years. Steady flow (5-10 GPM) from the ground to the floor of the valve chamber was noted. This reportedly has been constant since before the 1954 renovations.
 3. **Low Level Blowoff:** The blowoff is controlled by a 24 inch sluice gate below the dam's west crest and is operated by a lift mechanism on the top of the dam (Photo C-7). The conduit extends through the base of the dam to a 4 foot square opening in the face of the dam at the tailwater level. It was last operated in the summer of 1979.
 4. **Twin Flood Gates:** Two flood gates are located below the dam's east crest at a shallow level (Photos C-5, 6). They are controlled by lift mechanisms on the top of the dam and appear in good condition. A 4 inch gate valve at the base of the flood gates is maintained in an open condition as per an agreement with adjacent homeowners. A natural, rock discharge channel rejoins the Mianus River just downstream of the dam.
- d. **Reservoir Area:** The dam creates an impoundment extending upstream in the natural riverbed. The upstream sides of the river seemed to be in a natural state

with no visible signs of erosion or sloughing. There were two trees in the riverbed that the maintenance personnel are trying to have removed, but some difficulty was noted (Photo C-1). Concern was expressed that during a heavy storm these trees could be a problem.

No geologic features were detected that could be expected to adversely affect the dam or appurtenant structures.

Trespassing on the dam is not permitted and the proximity of personnel in the adjacent filter plant building reduces the potential for trespassing.

- e. **Downstream Channel:** The spillway and downstream channel retaining walls appear to be founded on bedrock and are generally in fair condition (Photo 11). Some trees overhang the west side of the channel and access to this side is difficult. There is a metering weir about 440 feet downstream of the spillway which appears to be in good condition. On the right side of the spillway channel just below the face of the dam there are some holes behind the retaining walls noted. The cause is unknown; however, it appeared to be related to erosion.

3.2 Evaluation

Based on the visual inspection, the Mianus Filter Plant Dam appears to be in fair condition and there are specific areas of concern that should be addressed:

The leakage on the downstream face and slope.

The missing mortar and holes on the faces of the dam.

The trees in the upstream channel bed.

SECTION 4

OPERATIONAL AND MAINTENANCE PROCEDURES

4.1 Operational Procedures

- a. **General:** The responsibility for the operation and maintenance of this facility is with the Connecticut American Water Company. The maintenance staff is headquartered at the water treatment facility which is adjacent to the dam site. These staff personnel operate and maintain the valves and equipment for the water treatment facility. Operation of the valves is in general for the sole purpose of regulating the water supply to the plant. No written procedure is available for emergency operation of the blowoff system, but one is now being written. The last time the hydraulic 20 inch blowoff to the 30 inch supply main was opened was 6 to 10 years ago.
- b. **Description of Any Warning System in Effect:** There is no warning system in effect.

4.2 Maintenance Procedures

- a. **General:** The maintenance of the dam is centered around those valves and sluice gates that supply water to the filtration plant. The downstream face of the dam has recently been cleared of vegetation. The water has never been drawn down so that the upstream face of the spillway could be inspected or repaired.
- b. **Operating Facilities:** The operation facilities consist of two flood gates on the left abutment, one low level blowoff, and one sluice gate which controls the raw water to the filtration plant.

4.3 Evaluation

The operation and maintenance of this dam could be oriented so that it more directly deals with the emergency procedure to be followed in case of a heavy storm.

SECTION 5

EVALUATION OF HYDRAULICS/HYDROLOGIC FEATURES

5.1 General

The Mianus Filter Plant Dam, built across the Mianus River, creates a narrow impoundment with a total storage capacity of 101 ac.-ft. at elevation 69.65, the spillway crest. Each foot of depth in the pond above the spillway crest can accommodate approximately 7.5 ac.-ft. The spillway is a 65 foot long by 7 foot wide broad crested weir. Stream and basin slopes are flat to moderate having average grades of 0.5 percent to 2.0 percent.

5.2 Design Data

- a. No specific design data is available for this watershed or the structures of the Mianus Filter Plant Dam. In lieu of existing design information, U.S.G.S. Topographic Maps (Scale 1" = 2000') were utilized to develop hydrologic parameters such as drainage areas, reservoir surface areas, basin lengths, time of concentration and other runoff characteristics. Elevation - storage relationships for the reservoir were approximated. Surcharge storage was computed using the U.S.G.S. maps. Some of the pertinent hydraulic design data was obtained and/or confirmed by actual field measurements at the time of the visual field inspection.
- b. Outflow values (routing procedures) and dam overtopping analysis were computed in accordance with the guidelines developed by the Corps of Engineers. Judgment was used in calculating final values outlined in this report, which are quite approximate and should not be considered a substitute for actual detailed analysis.

5.3 Experience Data

Historical Data for recorded discharges is limited and consists of records obtained since 1955 from a small measurement weir 440 feet downstream of the dam. The recent maximum discharge occurred on June 19, 1972 when the flow was in excess of 310 cfs (200 MGD), the upper range of the flow recorder.

5.4 Test Flood Analysis

Recommended guidelines for the Safety Inspection of Dams by the Corps of Engineers were used for the selection of the "Test Flood". This dam is classified as

a HIGH hazard and SMALL size structure. Guidelines indicate that 1/2 to 1 times Probable Maximum Flood (PMF) be used as the test flood for these classifications. A test flood of 1/2 PMF was chosen because the dam's height and impoundment storage are on the low side of the small size category. The watershed has a total area of 29.9 square miles. Snyder's lag was calculated to be 7.55 hours and a Snyder peaking coefficient of 0.625 was used. The 200 square mile - 24 hour probable maximum precipitation (PMP) is 22 inches. The flood hydrograph package, HEC-1 computer program, developed by the Corps of Engineers, was utilized to develop the inflow hydrograph, route the flood through the reservoir, and for the dam overtopping analysis. A test flood inflow was calculated to be 14200 cfs. The spillway was assumed to be the only outlet operating at the time of the flood, with the initial water level at the spillway crest.

The spillway capacity is hydraulically inadequate to pass the test flood (1/2 PMF) and overtopping of the dam will occur. The maximum outflow capacity of the spillway without overtopping the dam is 680 cfs. This corresponds to 5 percent of the test flood and a storage above the spillway level of 17 ac.-ft. The maximum outflow discharge value for the test flood is 14100 cfs corresponding to a depth of flow over the top of the dam of 7.5 feet and a storage above the spillway level of 318 ac.-ft. A spillway rating curve, outlet works (low level blowoff and flood gates) rating curves, and a reservoir surface area-capacity curve are included in Appendix D of this report.

At the spillway crest elevation of 69.65, the capacity of the low level blowoff is 74 cfs, and the capacity of flood gates is 206 cfs. It will require approximately .4 hours to lower the water level the first foot assuming a water surface area of 7.2 acres and use of these outlet works to regulate the water level for expected inflows. Storage for impending flood conditions can be provided quickly by use of the outlet works if the pool level is high. Use of the flood gates will lower the water level to elevation 65.15.

5.5 Dam Failure Analysis

This dam is classified as a high hazard structure. Failure discharge can cause loss of life and damage due to high velocities, impact from debris and flooding to 3 to 5 residential homes. Also, loss of this dam would impose hardships on the local community because of the loss of water supply.

Calculated dam failure discharge is 8463 cfs at a pool level equal to the top of the dam. At this elevation, the flow in the downstream channel would be equal to the full spillway discharge of 680 cfs or a depth of flow of approximately 2 to 3 feet downstream. Failure will produce a water surface level approximately 9.0 feet immediately downstream from the dam. The failure discharge will affect downstream areas for a distance of 4000 feet from the dam. At this distance the water surface

level will be approximately 4.5 feet above normal observations. Beyond 4000 feet, the effects of the failure discharge will be reduced as it enters Mianus Pond. Water surface elevations due to the failure of the dam are listed in Appendix D. Probable consequences including the prime impact areas, are also listed in Appendix D.

SECTION 6

EVALUATION OF STRUCTURAL STABILITY

6.1 Visual Observation

This inspection revealed no signs of major physical distress in the structure. However, leakage was noted on the downstream face and embankment.

6.2 Design and Construction Data

The only design or construction data available were the contract drawings from the 1954 renovation of the treatment plant. These drawings revealed that the only work done to the dam was the fixing of sluice gates to facilitate a smoother operation of the water treatment process. The absence of any stability computations makes the visual aspect of this report the primary basis for evaluation.

6.3 Post Construction Changes

The following changes to Mianus Filter Plant Dam facility have been noted since its construction in the 1870s.

- a. Retaining wall replacement or repair of the downstream spillway channel.
- b. Replacement of the sluice gates for the 30 inch diameter raw water supply pipe and the low level blowoff.
- c. Replacement of the sluice gates and their operators for the flood control gates on the east abutment of the dam.
- d. Construction of a metering weir approximately 440 feet downstream of the dam.

All of the above changes took place during the 1954 renovation project.

6.4 Seismic Stability

This dam is in Seismic Zone 1 and hence does not require evaluation for seismic stability according to the USCE Recommended Guidelines.

SECTION 7

ASSESSMENT, RECOMMENDATIONS AND REMEDIAL MEASURES

7.1 Dam Assessment

- a. **Condition:** After study of the contract plan for the 1954 renovation and the results of this inspection, the conclusion is that the general condition of the dam at the Mianus Filter Plant is FAIR. The stability of the original design was probably good based on the visual inspection and past performance. However, age and seepage have taken their toll and further study could reveal the need for specific design improvements.
- b. **Adequacy of Information:** The information available is such that the assessment of the safety of the dam is based primarily on the visual inspection results and the past operational performance of the structure.
- c. **Urgency:** It is considered that the recommendations suggested below be implemented by the owner within one year of receipt of this Phase I Inspection Report.

7.2 Recommendations

It is recommended that the owner engage a qualified registered engineer to carry out the following actions:

- a. A detailed hydrologic-hydraulic investigation to determine the need and means of increasing the discharge capacity of the project.
- b. The pond be lowered and the upstream face be visually inspected and the toe be checked for potential undermining.

7.3 Remedial Measures

a. Operation and Maintenance Procedures:

1. Trees from the floor of the upstream riverbed should be removed as soon as possible.
2. The seepage on the downstream face should be monitored to note any change from the existing conditions.

3. Repointing of the downstream face of the abutment and replacing of loose stones on the left abutment, with repointing and replacement wherever it is needed.
4. Develop a formal flood warning and surveillance plan, including round-the-clock monitoring during heavy precipitation.
5. Insure the operability of all gate valves and blowoffs.
6. Institute a program of annual periodic technical inspection with particular emphasis on the entire downstream face for signs of distress and leakage.

7.4 Alternatives

None.

APPENDIX A

INSPECTION CHECK LIST

INSPFCTION CHECK LIST

PARTY ORGANIZATION

PROJECT MIANUS FILTER PLANT DAM DATE November 13, 1979

TIME 1:00 - 3:00 P.M.

WEATHER Overcast

W.S. ELEV. U.S. DN.S.

PARTY:

- | | |
|-----------------------------|---|
| 1. <u>R. Johnston, JPPA</u> | 6. <u>B. McCormick - Connecticut American Water Company</u> |
| 2. <u>R. Lyon, JPPA</u> | 7. _____ |
| 3. <u>G. Salzman, CWDD</u> | 8. _____ |
| 4. _____ | 9. _____ |
| 5. _____ | 10. _____ |

PROJECT FFATURE	INSPFCTFD BY	RFMARKS
1. <u>Hydraulics</u>	<u>R. Johnston</u>	_____
2. <u>Structural</u>	<u>R. Lyon</u>	_____
3. <u>Geotechnical</u>	<u>G. Salzman</u>	_____
4. _____	_____	_____
5. _____	_____	_____
6. _____	_____	_____
7. _____	_____	_____
8. _____	_____	_____
9. _____	_____	_____
10. _____	_____	_____

INSPECTION CHECK LIST

PROJECT MIANUS FILTER PLANT DAMDATE November 13, 1979PROJECT FEATURE NAME DISCIPLINE NAME

AREA EVALUATED	CONDITION
<u>DAM EMBANKMFNT</u>	
Crest Elevation 72.15 East 74.70 West	Good - Stone Crest
Current Pool Elevation 69.9+/-	Good - 3 inches above spillway
Maximum Impoundment to Date	
Surface Cracks	None observed.
Pavement Condition	N/A
Movement or Settlement of Crest	None observed.
Lateral Movement	None observed.
Vertical Alignment	Good
Horizontal Alignment	Good
Condition at Abutment and at Concrete Structures	Large spaces up to 18" deep between stones.
Indications of Movement of Structural Items on Slopes	None observed.
Trespassing on Slopes Vegetation on Slopes Sloughing or Erosion of Slopes or Abutments	Not permitted. Ground cover on right downstream face. None observed.
Rock Slope Protection - Riprap Failures	N/A
Unusual Movement or Cracking at or near Toes	None observed.
Unusual Embankment or Downstream Seepage	Slight on faces and from ground just below left face.
Piping or Boils	None observed.
Foundation Drainage Features	None observed.
Toe Drains	None observed.
Instrumentation System	Weir located 440 ft. downstream from dam.

INSPECTION CHECK LIST

PROJECT MIANUS FILTER PLANT DAMDATE November 13, 1979

PROJECT FEATURE _____

NAME _____

DISCIPLINE _____

NAME _____

AREA EVALUATED	CONDITION
<u>OUTLET WORKS - INTAKE CHANNEL AND INTAKE STRUCTURE</u>	
a. Approach Channel	Entire riverbed - underwater.
b. Intake Structures	
30 inch supply pipe	30 inch sluice gate with bar rack. Controlled by gear lift on top of dam and maintained in an open condition. Visible portion in good condition and appears operable.
Low Level Blow Off	24 inch sluice gate controlled by gear lift on top of dam. Visible portion in good condition and appears operable.
Flood Gates	Twin 4 ft. wide by 5 ft. high slide gates controlled by gear lifts on top of dam. 4 inch gate valve at base between slide gates maintained in open condition. Visible portions in good condition and appear operable.

INSPECTION CHECK LIST

PROJECT MIANUS FILTER PLANT DAMDATE November 13, 1979

PROJECT FEATURE _____

NAME _____

DISCIPLINE _____

NAME _____

AREA EVALUATED	CONDITION
<u>OUTLET WORKS - TRANSITION AND CONDUIT</u>	
30 Inch Supply Pipe	30 inch pipe extends from the intake to a 24 inch tee (to blow offs) and a 24 inch valve. A 24 inch pipe then continues to filters.
Low Level Blow Off	Square 4 ft. by 4 ft. blow off extends from the intake through the dam to the downstream face.
Flood Gates	An arched opening 10 ft. wide by 5 ft. high (at crown) and 4 ft. high (at sides) extends from the intakes through dam to the downstream face.

INSPECTION CHECK LIST

PROJECT MIANUS FILTER PLANT DAM DATE November 13, 1979

PROJECT FEATURE _____ NAME _____

DISCIPLINE _____ NAME _____

AREA EVALUATED	CONDITION
<u>OUTLET WORKS - OUTLET STRUCTURE AND OUTLET CHANNEL</u>	
30 Inch Supply	20 inch and 6 inch blow offs from the 24 inch tee discharge to the river. Hydraulically controlled valves are located in an underground concrete chamber, but are controlled from the plant building. Not operated for at least 6 years, but reportedly are operable. A steady flow (10 GPM+) was noted into chamber from the ground.
Low Level Blow Off	A 24 inch line continues to the filters and then to distribution lines. Fire hydrants in service area could be opened to drain pond.
Flood Gates	Discharges from the downstream face of dam to the river.
	Discharges from the downstream face of dam through a natural rock channel to the river.

INSPECTION CHECK LIST

PROJECT MIANUS FILTER PLANT DAM

DATE November 13, 1979

PROJECT FEATURE

NAME

DISCIPLINE

NAME

AREA EVALUATED	CONDITION
<u>OUTLET WORKS - SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS</u>	
a. Approach Channel	Entire riverbed - underwater
General Condition	
Loose Rock Overhanging Channel	
Trees Overhanging Channel	
Floor of Approach Channel	
b. Weir and Training Walls	
General Condition of Granite Blocks	Good
Rust or Staining	N/A
Spalling	None observed.
Any Visible Reinforcing	None observed.
Any Seepage or Efflorescence	Spillway flowing - not visible.
Drain Holes	None observed.
c. Discharge Channel	Entire riverbed underwater.
General Condition	Good
Loose Rock Overhanging Channel	None observed.
Trees Overhanging Channel	Yes.
Floor of Channel	Underwater - apparently rock.
Other Obstructions	5.5 ft. high weir 440 ft. downstream from dam.

APPENDIX B

ENGINEERING DATA

APPENDIX B-1

DESIGN, CONSTRUCTION AND MAINTENANCE RECORDS AND LOCATION

Mr. Victor J. Galgowski
Dam Safety Engineer
Water and Related Resources Unit
Department of Environmental Protection
State of Connecticut
State Office Building
Hartford, Connecticut 06115

Connecticut American Water Company
125 East Putnam Avenue
Greenwich, Connecticut 06830

APPENDIX B-2

COPIES OF PAST INSPECTION REPORTS

No. _____

WATER RESOURCES COMMISSION
SUPERVISION OF DAMS

Inventoried _____

INVENTORY DATA

By _____

Long. 13-3-1-45

Date _____

Lat. 41-0-1-09

Name of Dam or Pond MILLY LITTER PLANT POND

Code No. MI 38

Nearest Street Location Valley Rd

Town Greenwich

U.S.G.S. Quad. Stamford

Name of Stream Housatonic River

Owner Greenwich Light Co.

Mr. J. W. [unclear]

Address 175 E. Putney St.

Greenwich, Conn.

Sec 9-5500 Oct 3/78

0.22 ac

Pond Used For Water Supply

Dimensions of Pond: Width 150' Length 1,000' Area 150

Total Length of Dam 200' Length of Spillway 100'

Location of Spillway Cross Stream

Height of Pond Above Stream Bed 20'

Height of Embankment Above Spillway 20'

Type of Spillway Construction Concrete

Type of Dike Construction Concrete

Downstream Conditions Flat, 60' f.d.

Summary of File Data _____

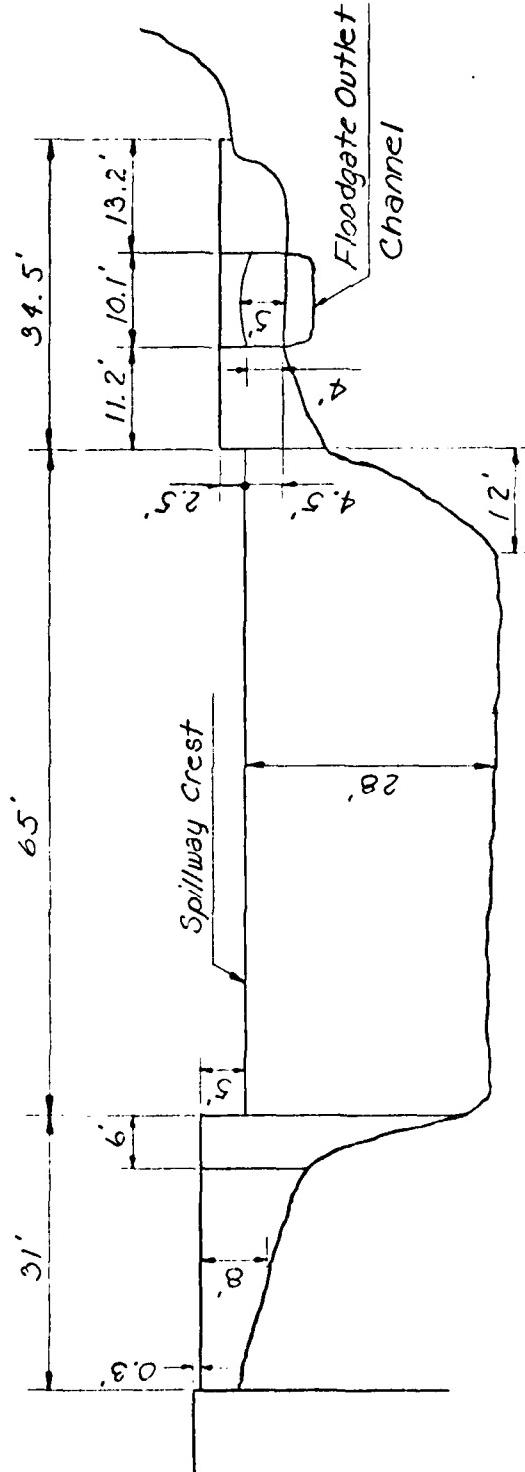
Remarks Highly Polluted, no water supply

Would Failure Cause Damage? _____

Class 1

APPENDIX B-3

RECORD DRAWINGS AND SKETCHES



NOTE:
All Dimensions Shown
Are Plus Or Minus

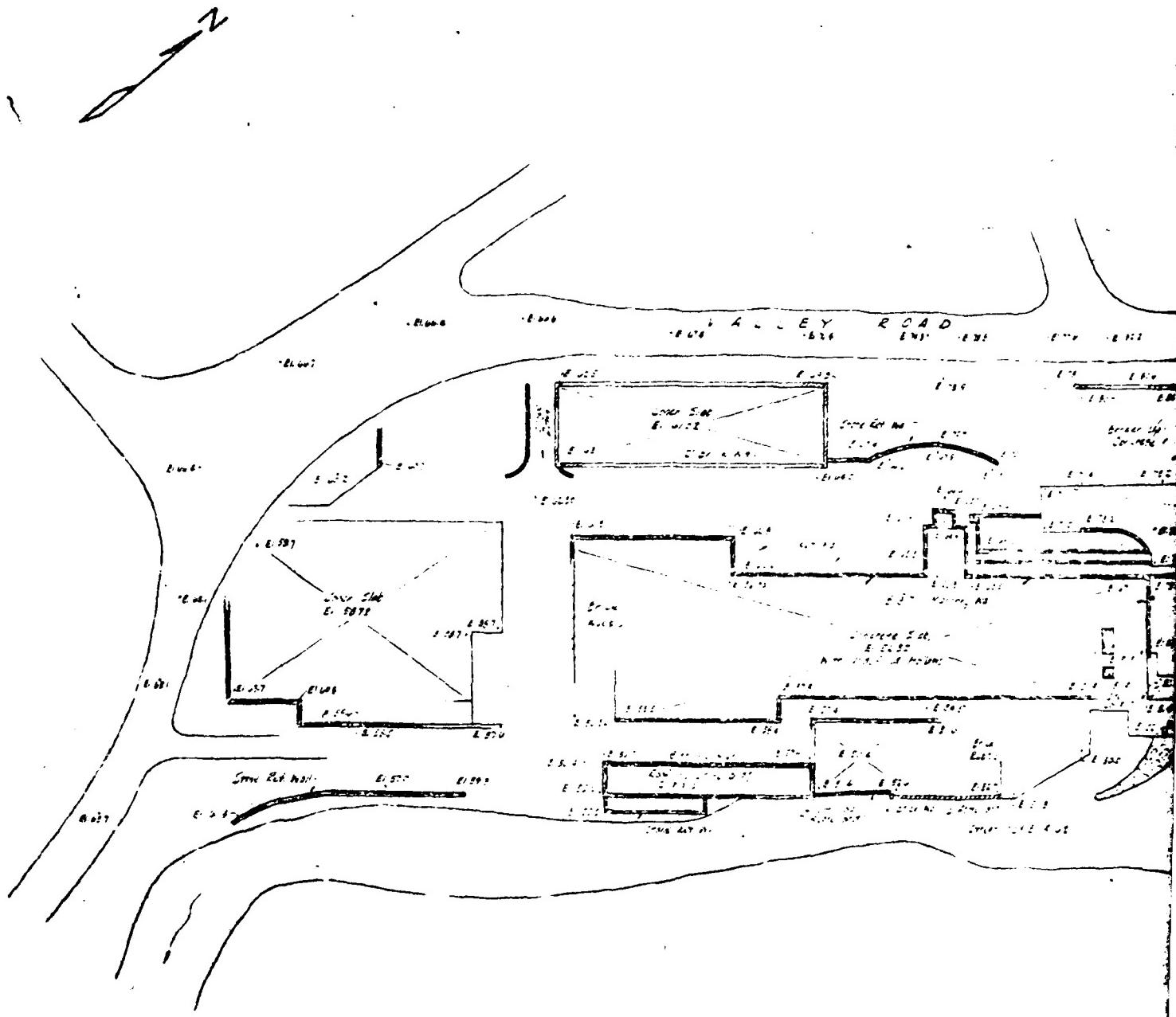
SKETCH OF DAM LOOKING UPSTREAM

SCALE: 1" = 20'

MIANUS FILTER PLANT DAM

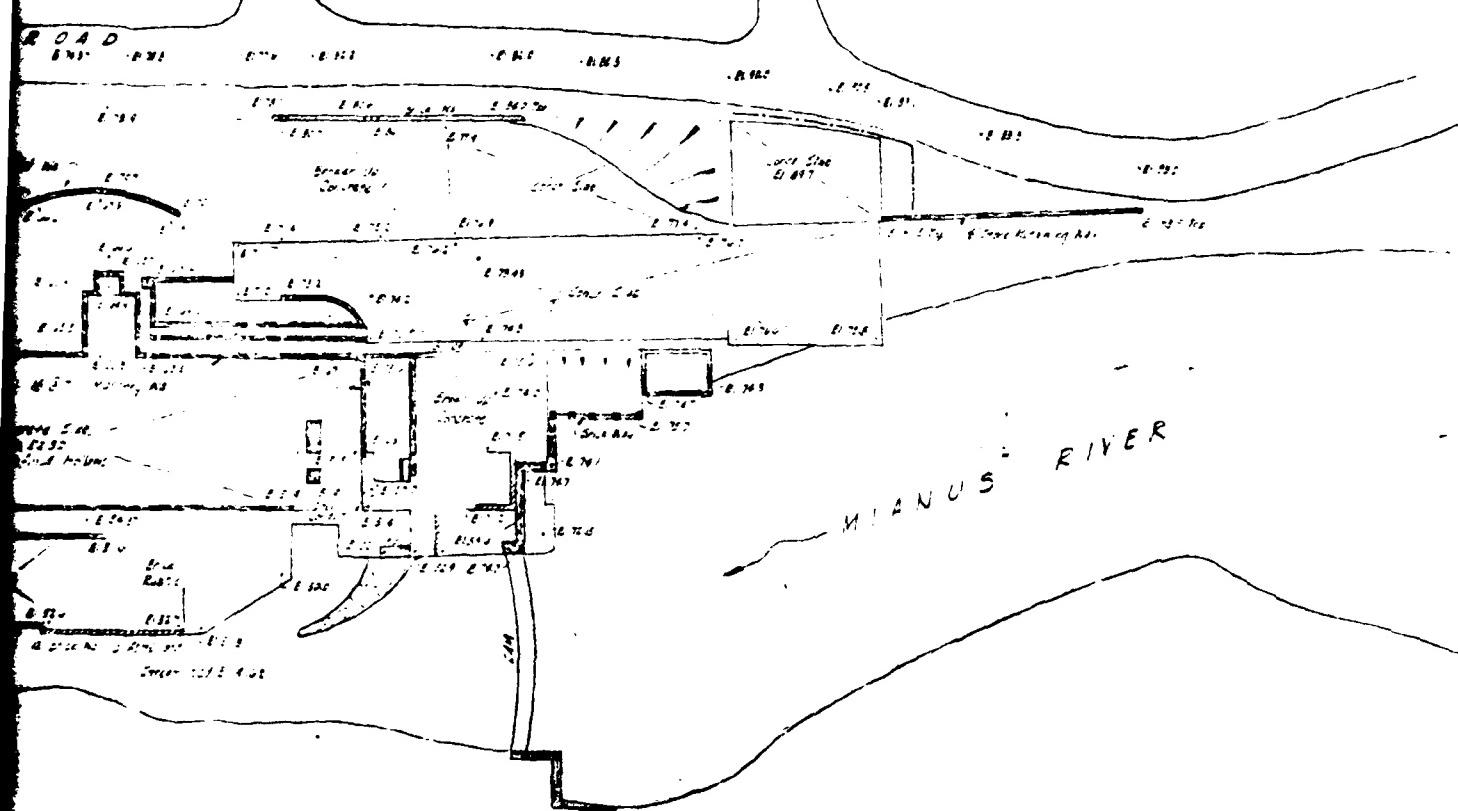
MANHATTAN ENGINEERING & PLANNING, INC.

ENGINEERS • ARCHITECTS • PLANNERS



B-6

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NOT TO

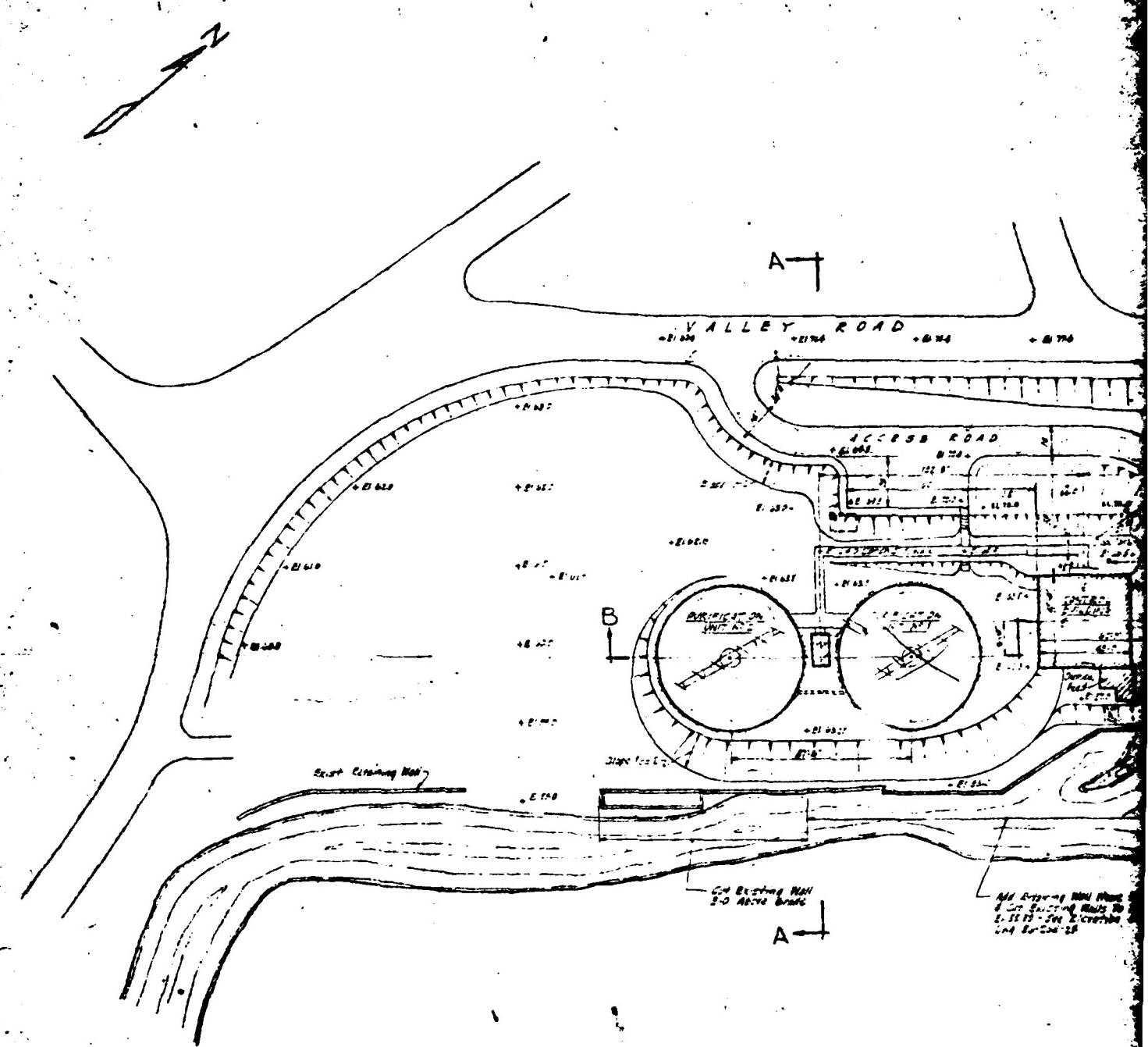


AMERICAN WATER WORKS COMPANY
GREENWICH, CONNECTICUT

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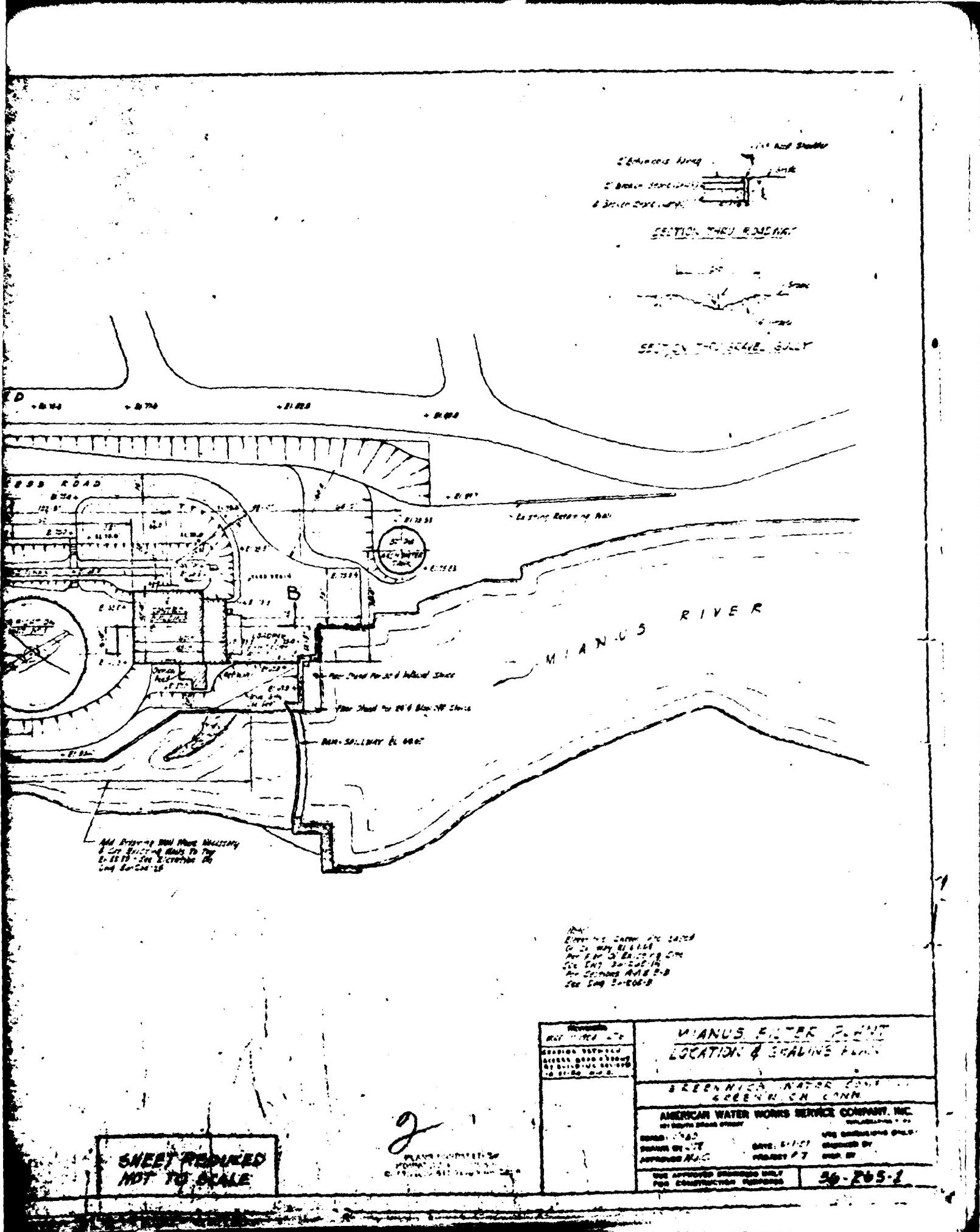
J
MANUALLY DRAWN
HOWARD CALLEN
CIVIL ENGINEER, P.E., N.Y.

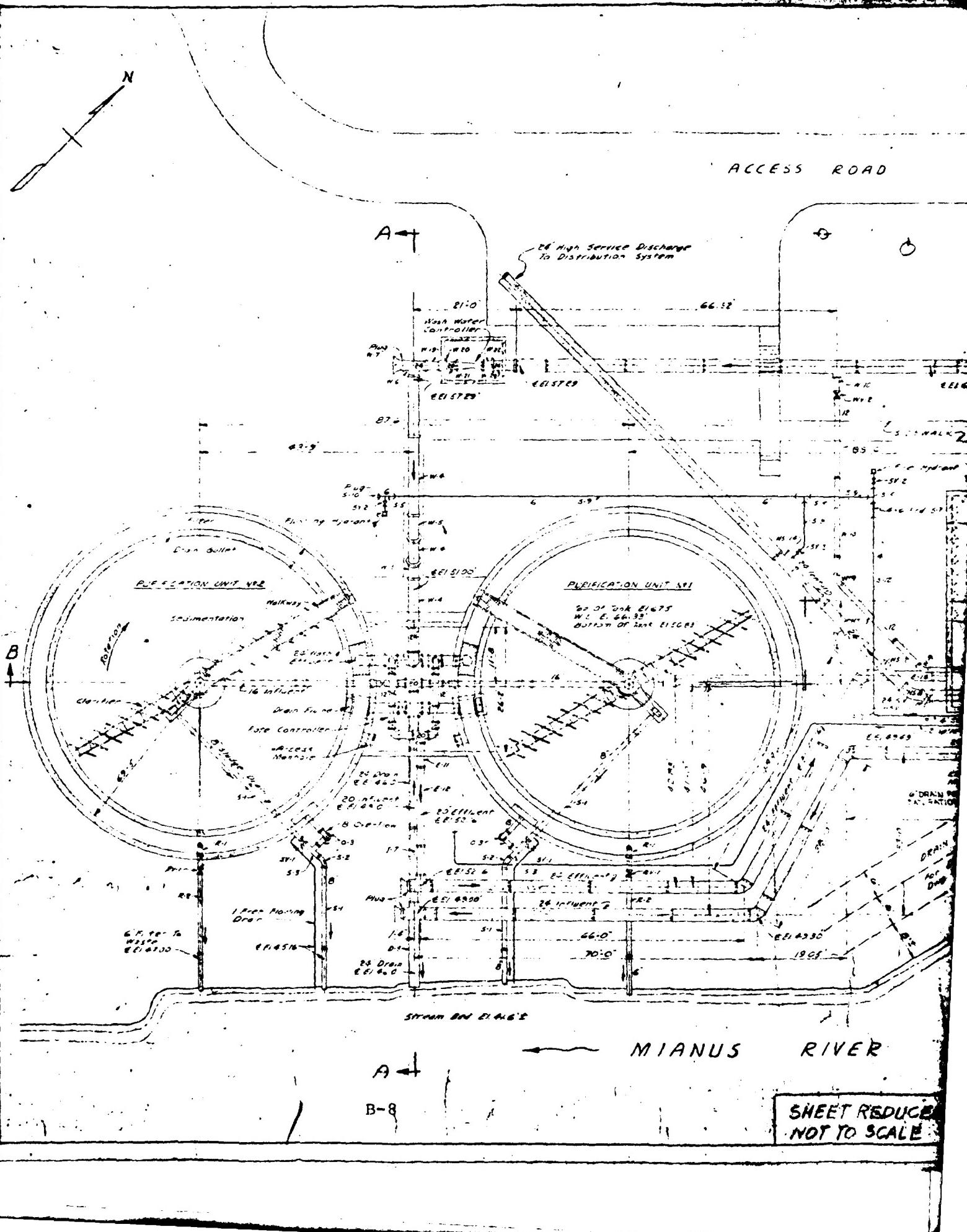
REVISIONS	MIANUS FILTER PLANT EXISTING PLANT SITE PLAN	
GREENWICH, CONNECTICUT GREENWICH, CONNECTICUT		
AMERICAN WATER WORKS SERVICE COMPANY, INC. 101 BROAD STREET PHILADELPHIA, PA.		
SCALE: 1/4" = 100'	DATE: 1/1/68	USE DIMENSIONS ONLY
DRAWN BY J.C.	CHECKED BY	APPROVED BY
APPROVED N.Y.C.	PROJECT NO.	PROP. BY
USE APPROVED DRAWINGS ONLY FOR CONSTRUCTION PURPOSES		36-265-1A



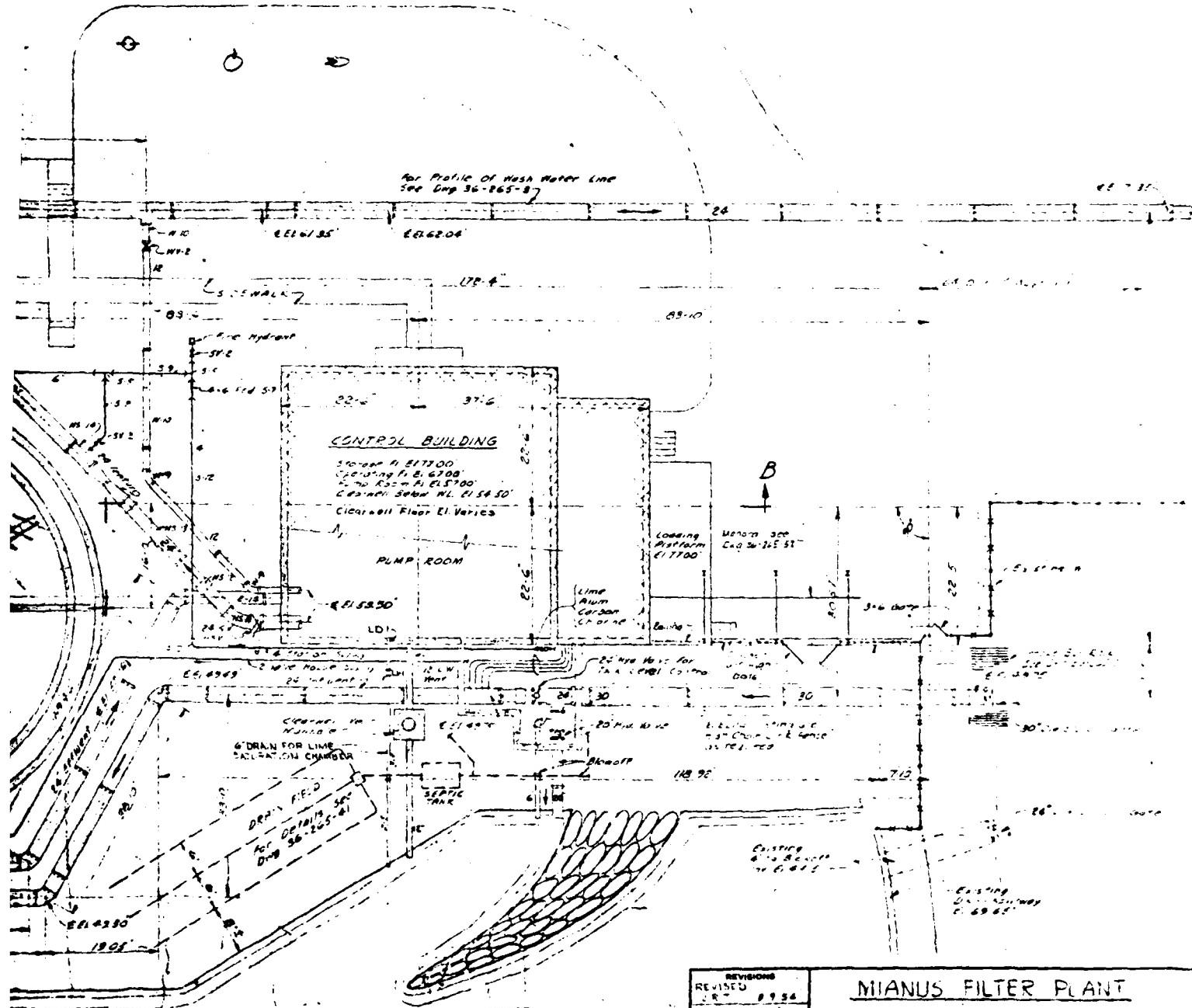
B-7

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ACCESS ROAD

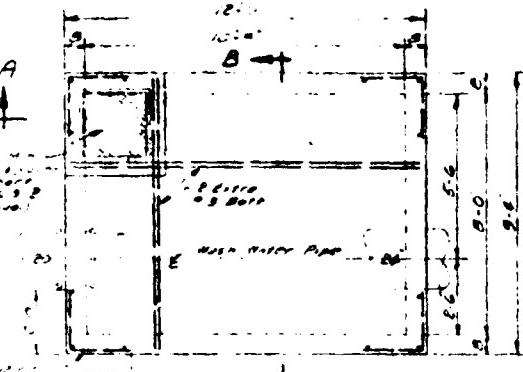


NOTE:
For Sections see
Drg. #96-265-B

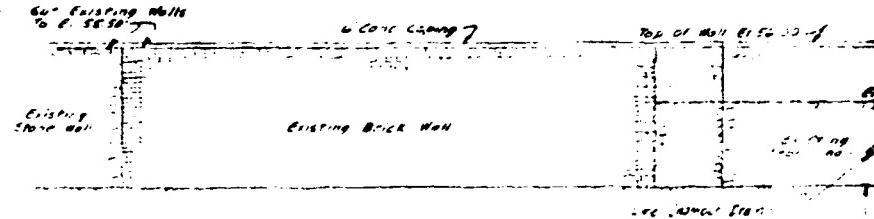
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PLATE PREPARED BY
MONA DOLAN, D.R.N.P.B.
ODON M. NUTRITION

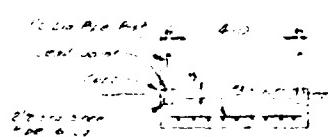
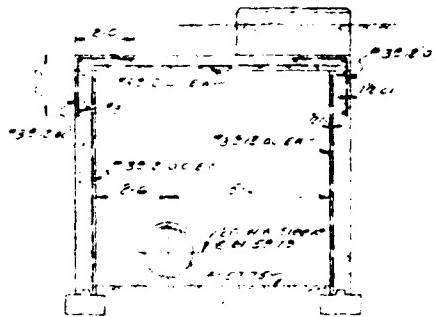
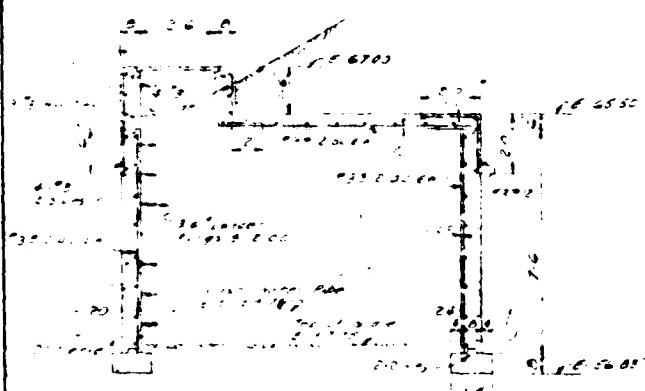
REVISIONS REVISED ERT 9-9-54 45000' STAGE ONE 3500' STAGE TWO 4000' STAGE THREE 2000' STAGE FOUR 1000' STAGE FIVE 100' STAGE SIX	<h1>MIANUS FILTER PLANT</h1> <h2>GENERAL PLAN</h2> <p>GREENWICH WATER CO GREENWICH, CONN</p> <p>AMERICAN WATER WORKS SERVICE COMPANY INC 101 SOUTH THIRD STREET PHILADELPHIA, PA</p> <p>SCALE 1'-0" USE DIMENSIONS ONLY DRAWN BY J.M.H. DRAWN 1-25-54 CHECKED BY APPROVED: PROJECT P-7 INS'D BY</p> <p>USE APPROVED DRAWINGS ONLY FOR CONSTRUCTION PURPOSES</p> <p>36-265-2</p>
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PLAN



RIVER

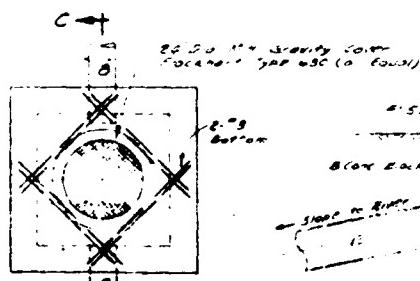


SECTION A-A

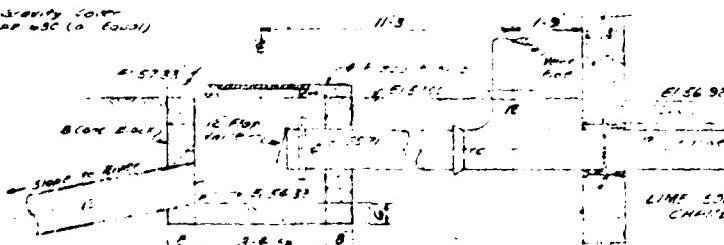
SECTION B-B

SECTION F-F

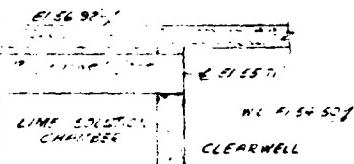
WASH WATER RATE CONTROLLER PIT DETAIL



PLAN

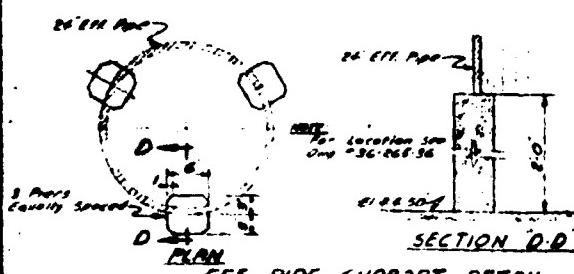


SECTION C-C



CLEARWELL VENT MANHOLE DETAILS

Scale 1/8"=1'-0"



PLAN

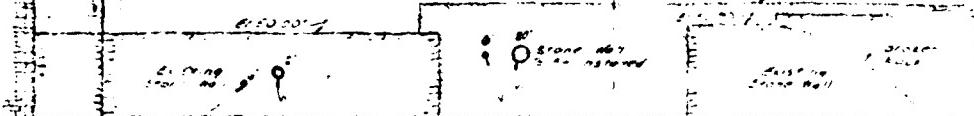
SECTION D-D

EFE PIPE SUPPORT DETAIL

B-9

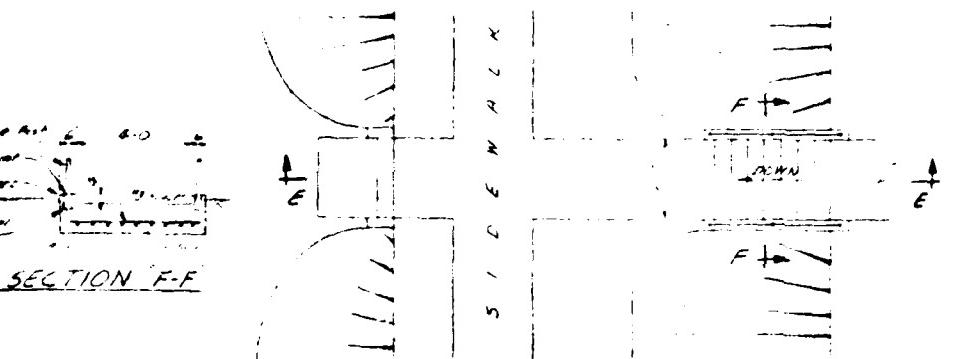
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No. of Map 36-265-2



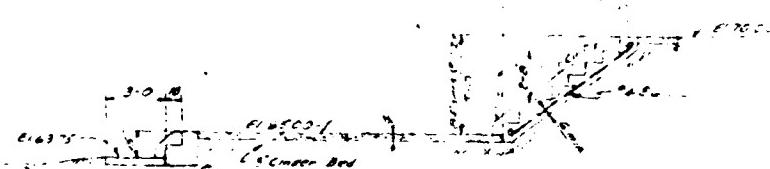
SECTION E-E
ELEVATION

RIVER BANK RETAINING WALL



NOTE: For location see
Drawing 36-265-1

PLAN



SECTION E-E

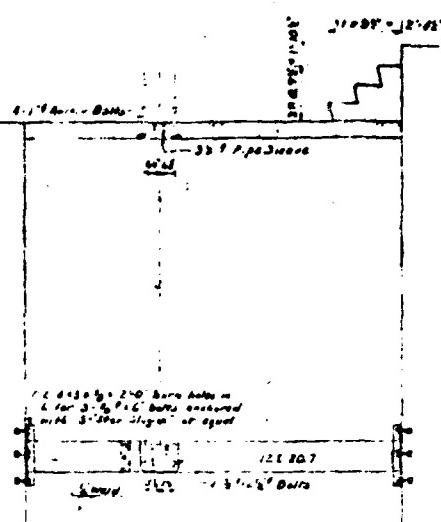
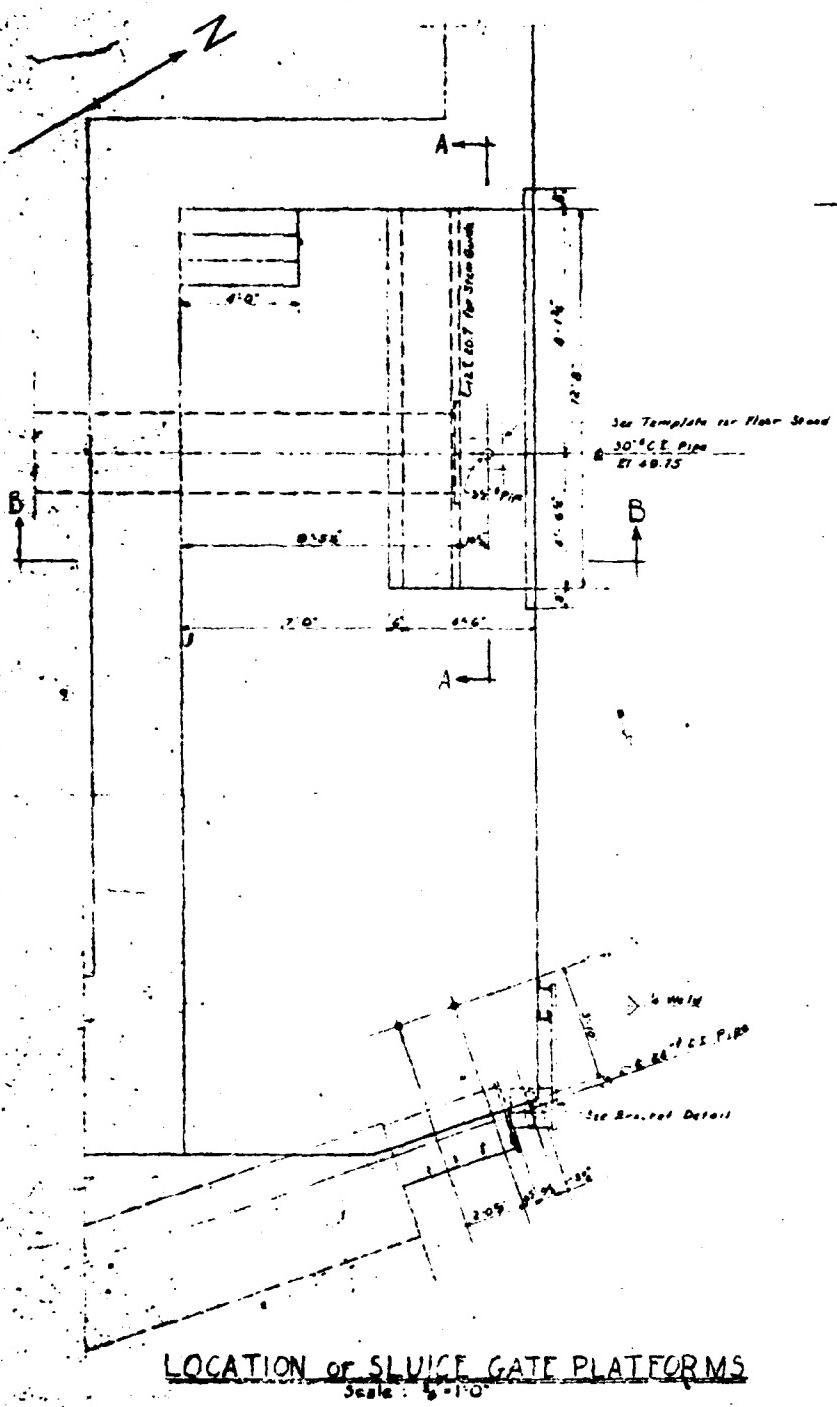
OUTSIDE STEP DETAILS

Scale 16'-0"

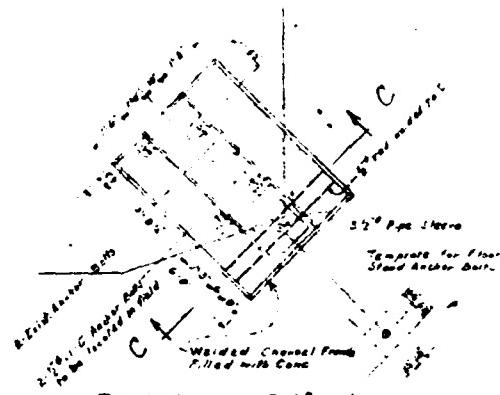
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PLANS FOR PLANT DUE
NOVEMBER 1, 1954
CONTRACT NUMBER 36-265-2

REVISIONS	MANUS FILTER PLANT MISCELLANEOUS CONCRETE DETAILS	
11-12-54	GREENWICH WATER CO GREENWICH, CONN	
AMERICAN WATER WORKS SERVICE COMPANY, INC 101 SOUTH GRAND STREET	DATE 8-8-54 DRAWN BY J.N.M APPROVED H.J.C	USE DIMENSIONS ONLY CHECKED BY PROJECT P-17 MNR BY
		USE APPROVED DRAWINGS ONLY FOR CONSTRUCTION PURPOSES
	36-265-2	



SEC. A.A.

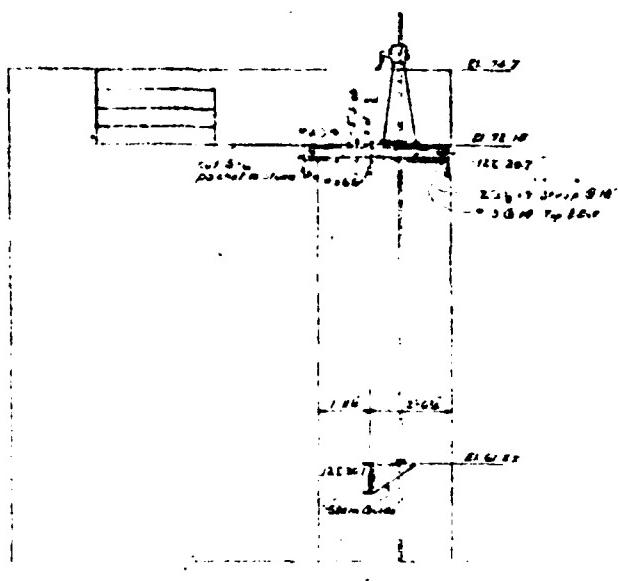


PLAN OF 24°
SLUICE GATE PLATFORM

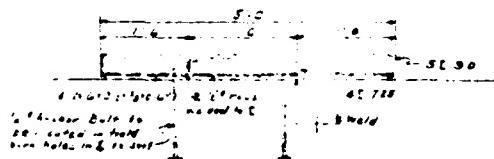
LOCATION OF SLUICE GATE PLATFORMS

B-10

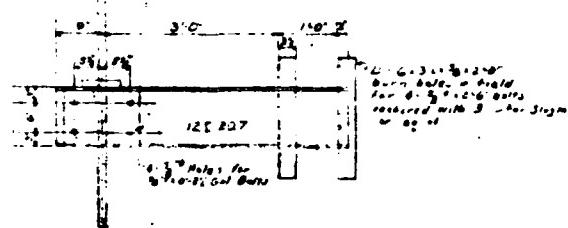
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SEC. B-B.
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SEC. C-C.
Scale $\frac{1}{4}'' = 1'-0''$



BRACKET FOR
STEM GUIDE
Scale $\frac{1}{4}'' = 1'-0''$

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PLANS PREPARED BY
HOWARD L. COLE, I.E.L.
CONN. REGISTRATION NO. 0266

MIANUS FILTER PLANT
DAM SLUICE GATE SUPPORTS
DETAILS

GREENWICH WATER COMPANY
GREENWICH, CT, USA

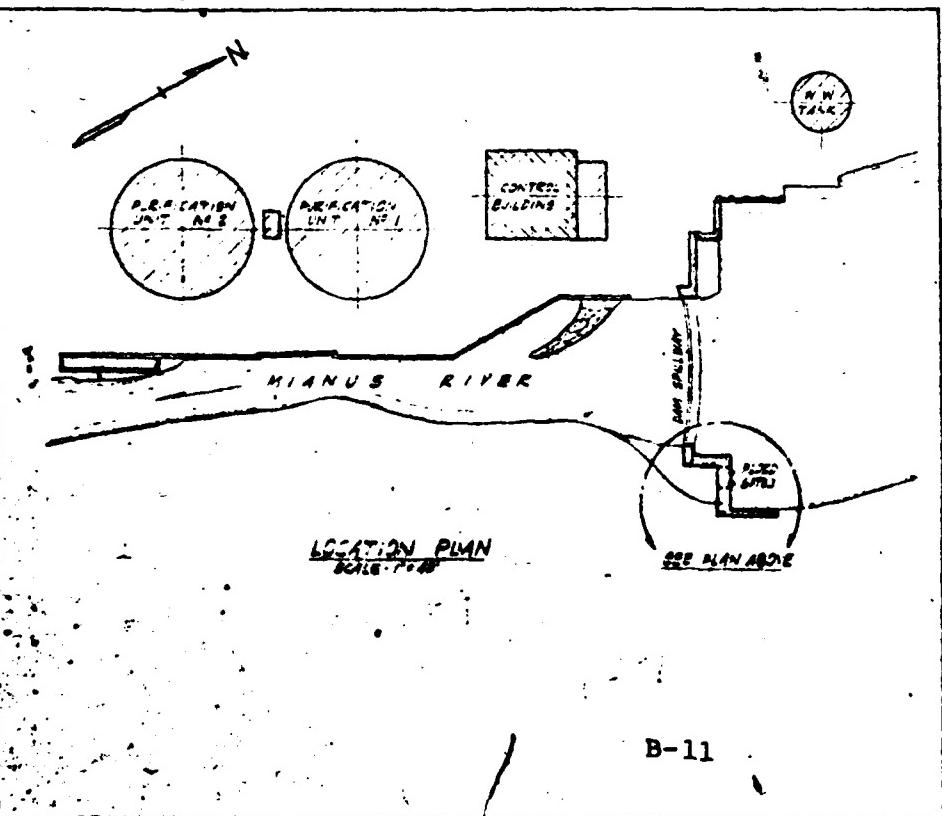
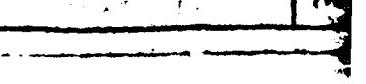
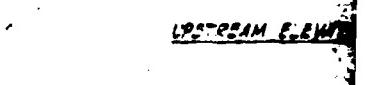
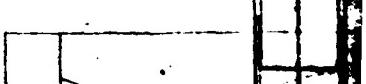
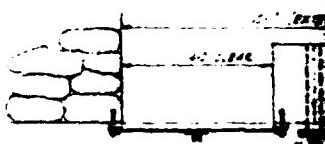
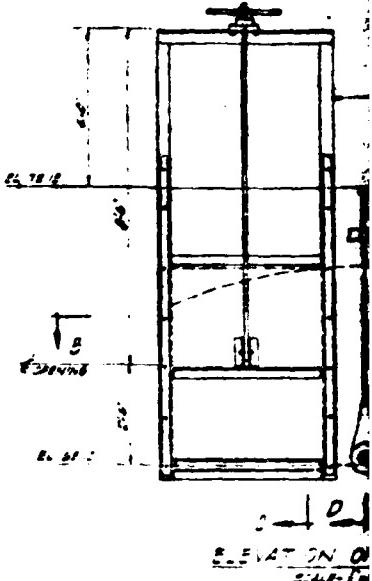
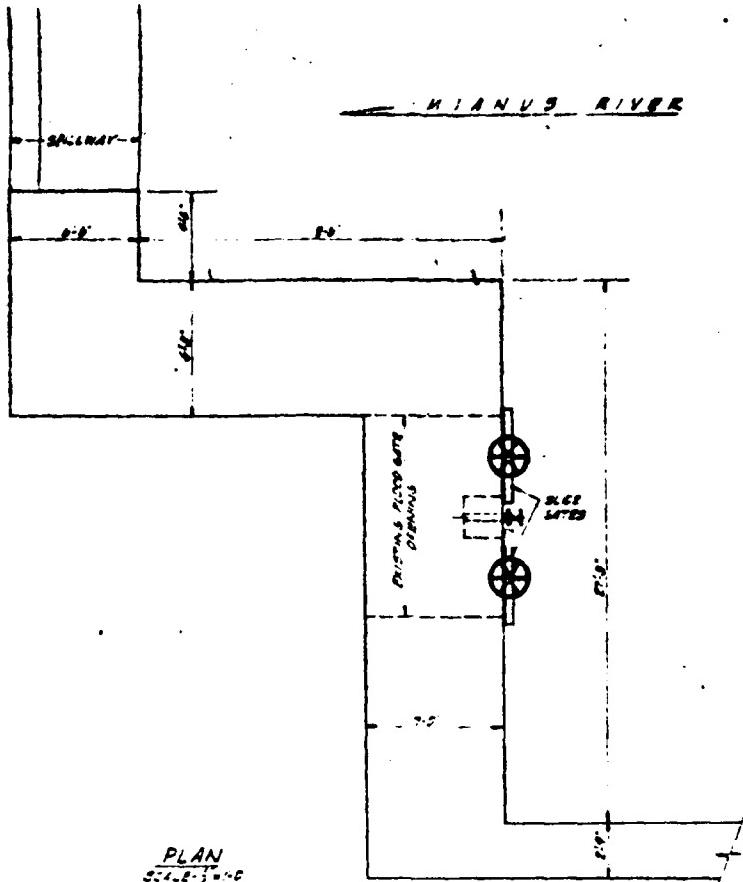
AMERICAN WATER WORKS SERVICE COMPANY, INC.
NEW YORK, NEW YORK

NOT DRAWN TO
SCALE BY E.L.C.
APPROVED AND
DRAWN BY E.L.C.

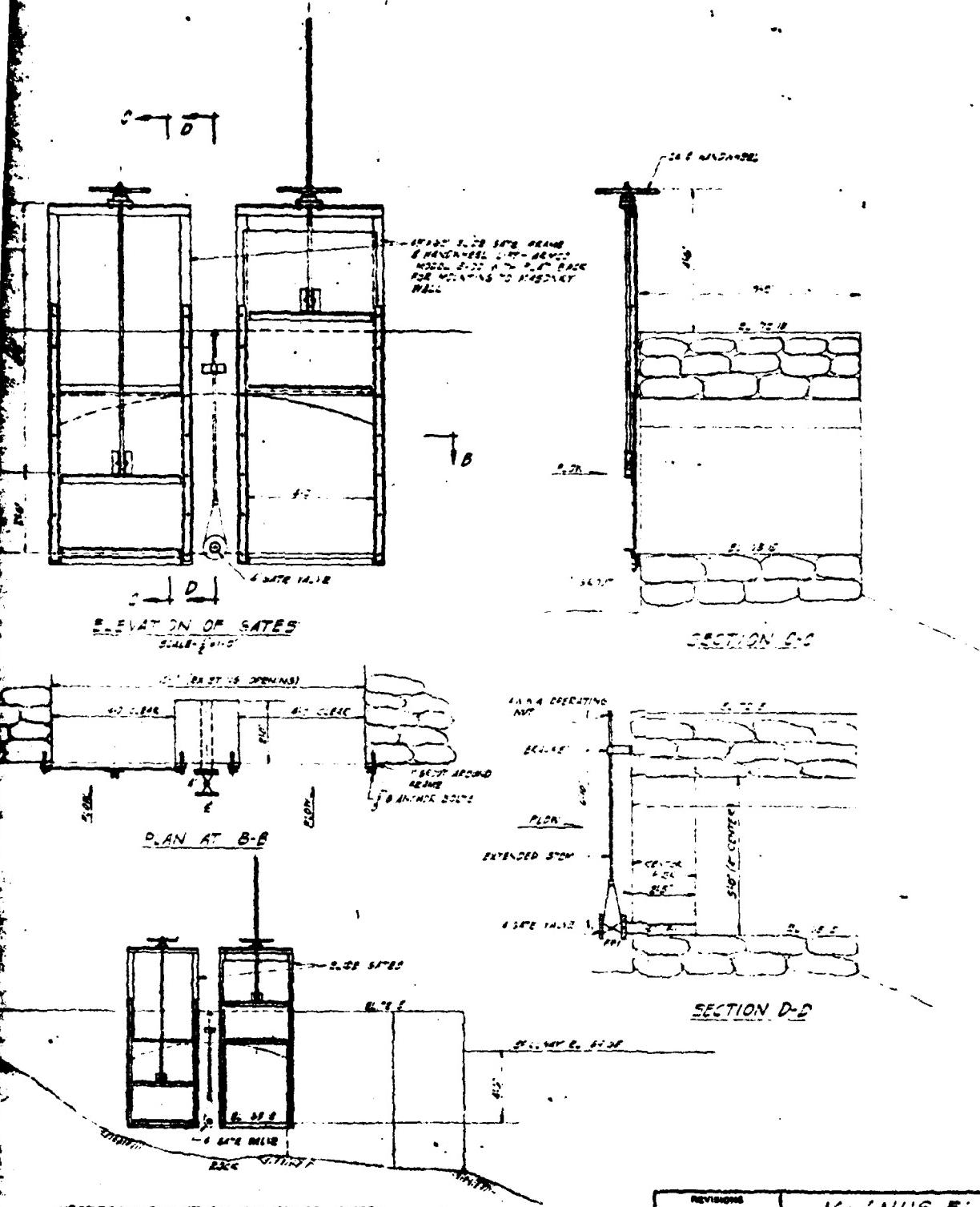
DRAWN 10-14-64 APPROVED BY E.L.C.
PROJECT 3-17 1964 BY

NOT APPROVED DRAWINGS ONLY
FOR CONSTRUCTION PURPOSES

36-265-29



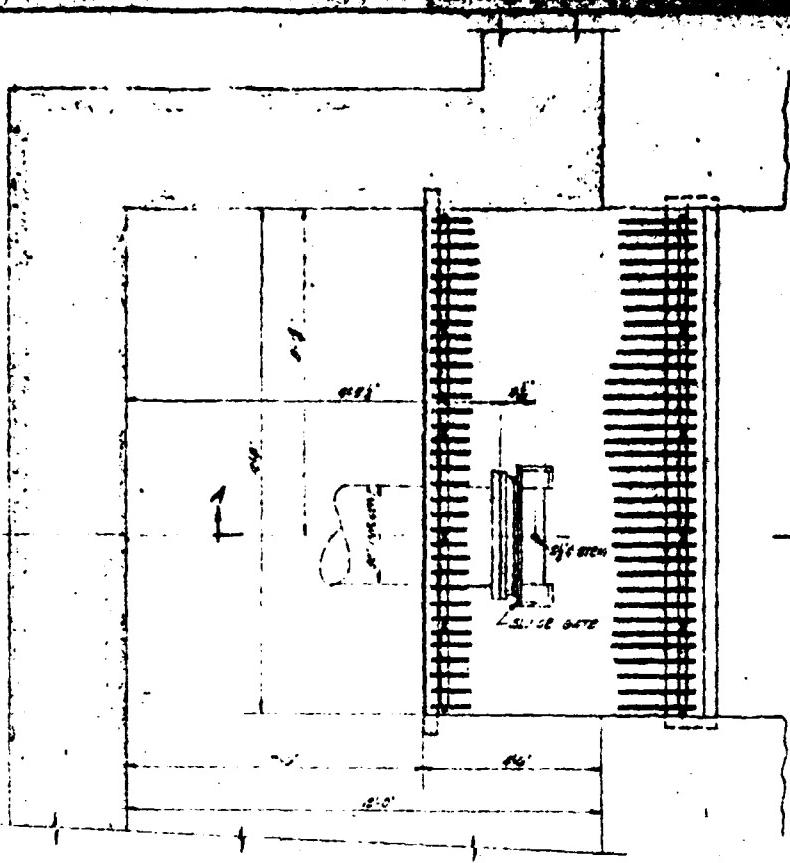
B-11



LATERAL ELEVATION OF FLOOD GATES

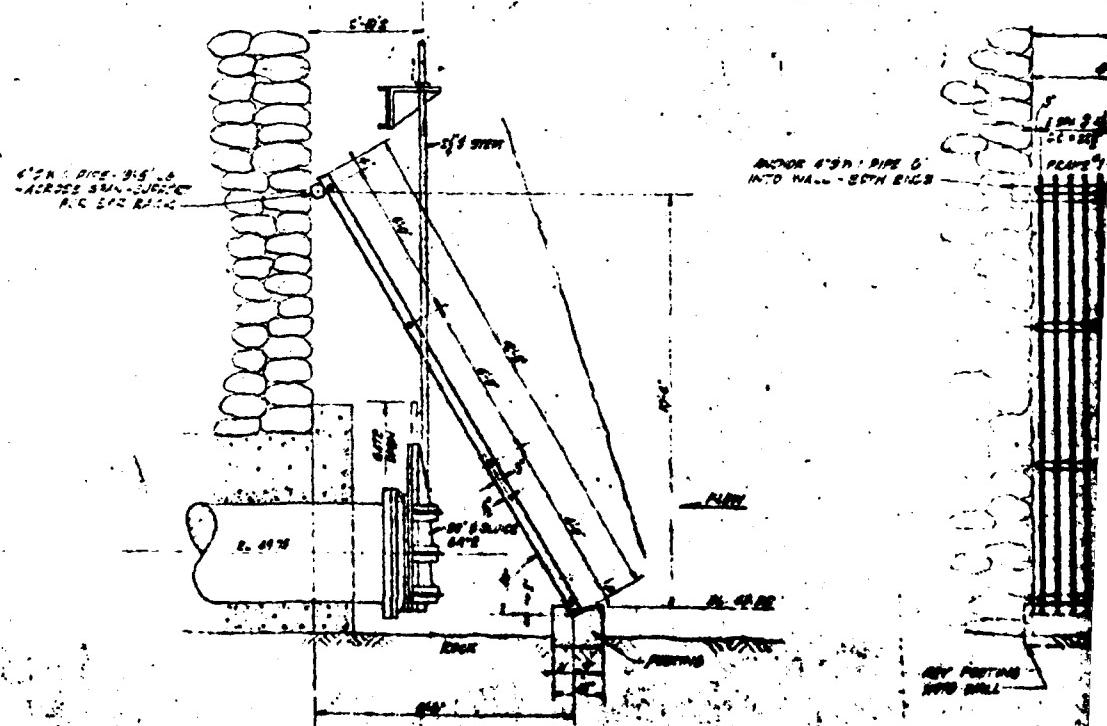
**SHEET REDUCED
NOT TO SCALE**

REVISIONS	MINUS FILTER F... FLOOD GATE DETAILS	
	GREENWICH BATTERIES GREENWICH	
	AMERICAN WATER WORKS SERVICE CO., INC. 301 SOUTH BROAD STREET	
DETAILS:	OUR ENGINEERING DEPT.	
DRAWN BY:	DRAWN BY: APPROVED BY:	
APPROVED BY:	PROMPTLY MAY 1967	
LINE APPROVED DRAWINGS FOR CONSTRUCTION PURPOSES		36-265-50



PLAN

FOR LOCATION PLAN
SEE S.A.S. EG-EGS-8



SECTION A-A

B-12

Stresemann

1950-5010-100-0000000000

~~REVIEW OF THE SPANISH & PORTUGUESE LITERATURE~~

2009-03-22 21:48:46.528 & 41° 05' 57"

PEPPER '92-1,000-2,300,000 H'LL 300-400

The diagram illustrates a mechanical assembly. It features two vertical rectangular columns positioned side-by-side. A horizontal rectangular beam is centered between them. On the left side of the left column, there is a label "TOP PLATE SPACERS" above a dimension "1/8". On the right side of the right column, there is a label "PULL ARMURE" above a dimension "1/8". At the bottom left, there is a label "STRENGTH
TEST STAND" above a dimension "1/8".

BAR ASS'Y DETAIL

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1000 PITCHFORD ST.
MURKIN & CARLOCK, P. C.
ATTORNEYS FOR DEFENDANT

H. AND F. THER. P.
INTAKE BAR ROCK
DETAILS

ST. LOUIS WATER WORKS SERVICE COMPANY, INC.

With permission from the author.

1978-1979 CROPPED BY
J. R. HARRIS

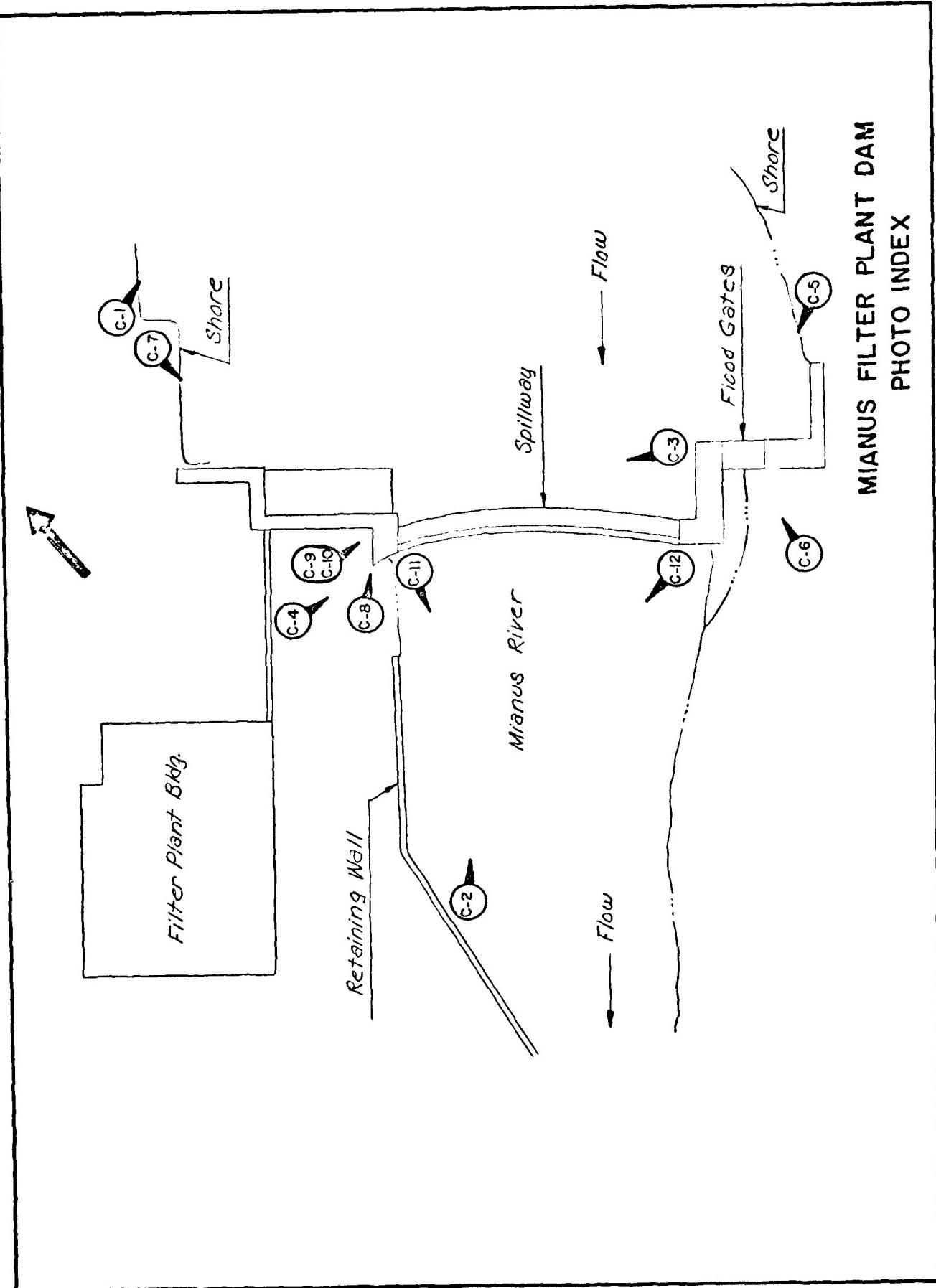
21 217

30-263-3

36-265-91

APPENDIX C
PHOTOGRAPHS

**MIANUS FILTER PLANT DAM
PHOTO INDEX**





C-1 UPSTREAM IMPOUNDMENT - LOOKING FROM WEST BANK

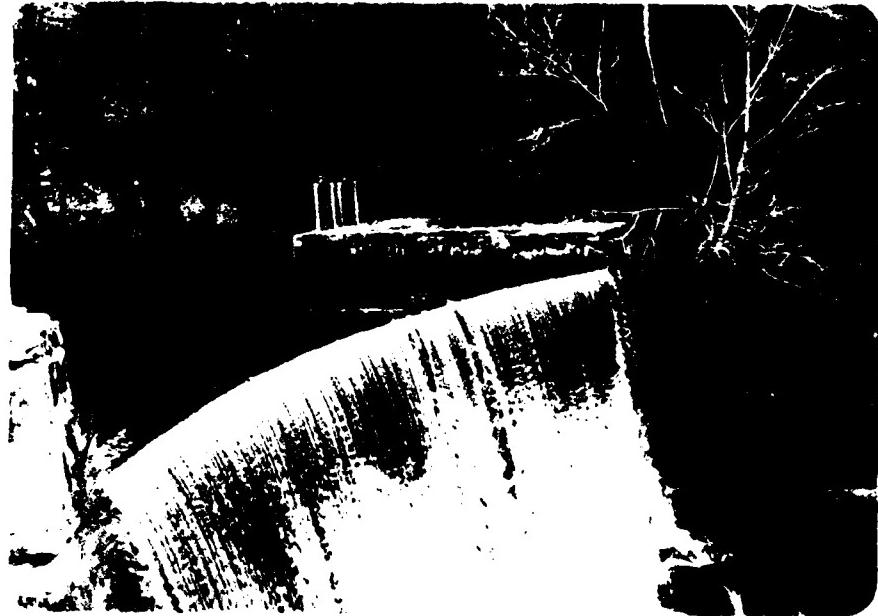


C-2 DOWNSTREAM FACE OF DAM AND SPILLWAY

C-1



C-3 WEST CREST OF DAM - LOOKING FROM FAST CREST



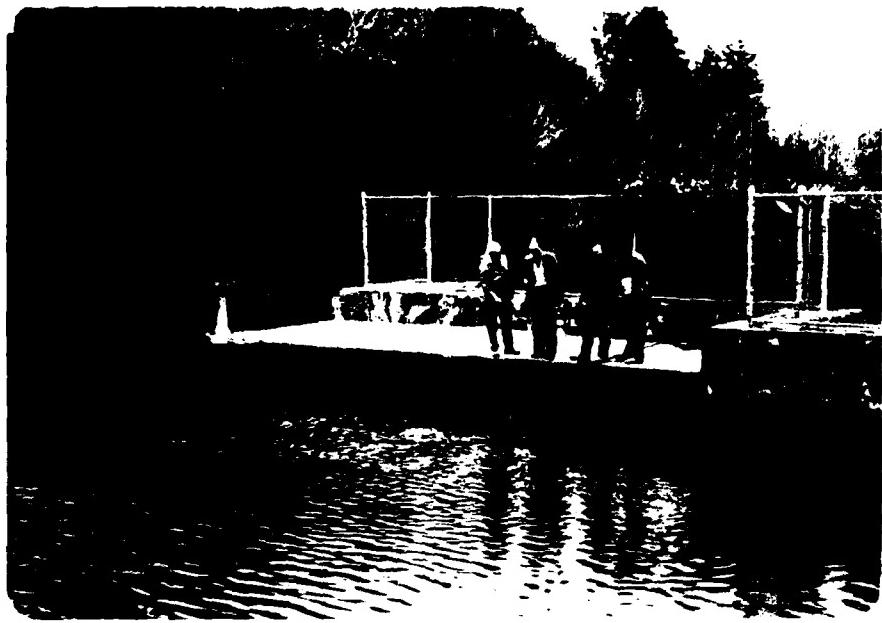
C-4 EAST CREST OF DAM - LOOKING FROM WEST BANK-
MENT



C-5 FLOODGATES ON EAST CREST



C-6 OPENING IN DOWNSTREAM FACE AT EAST CREST FOR FLOODGATES



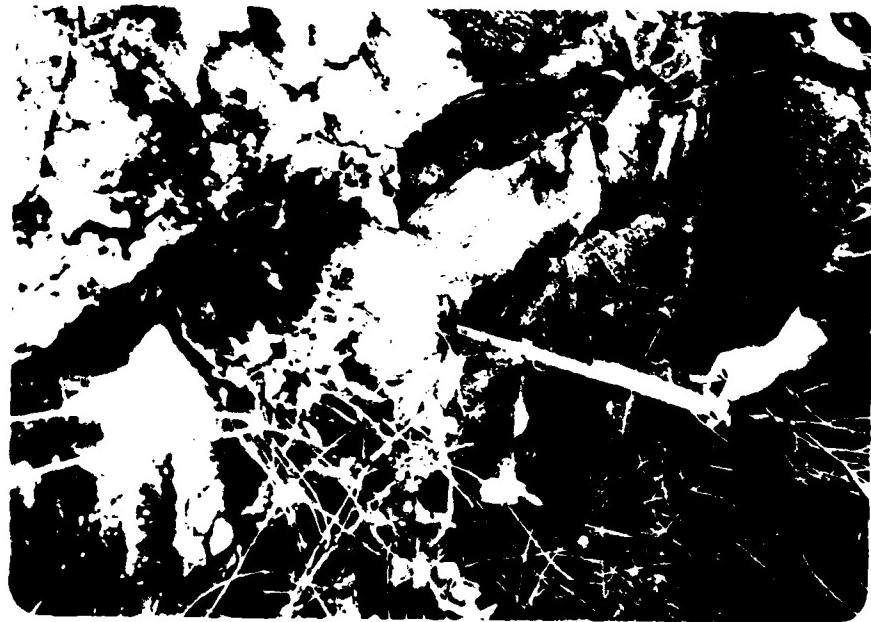
C-7 WEST CREST OF DAM - LOOKING FROM UPSTREAM
BANK ON WFST



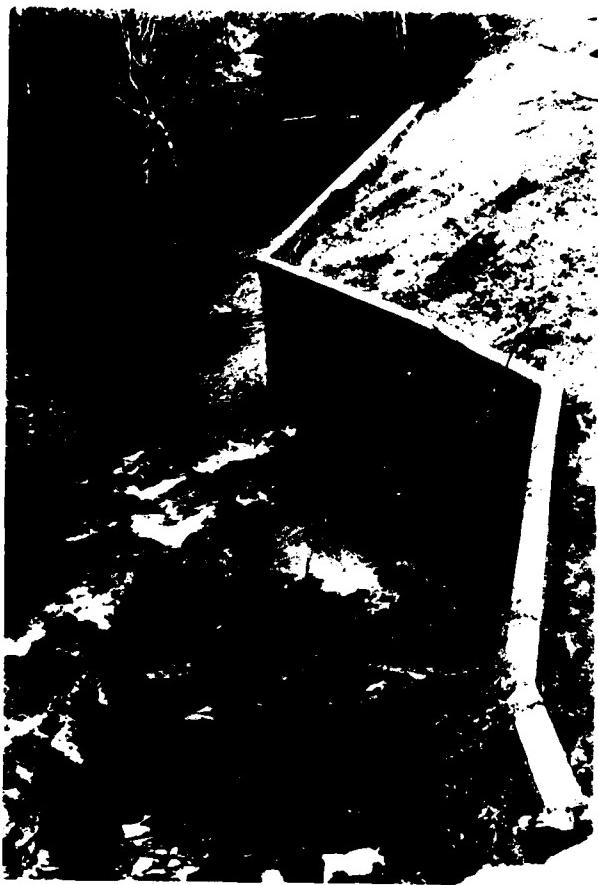
C-8 SEEPAGE POINT BELOW WEST CREST



C-9 SEEPAGE POINT BELOW WEST CREST



C-10 OPEN JOINT IN MASONRY ON DOWNSTREAM FACE
BELOW WEST CREST



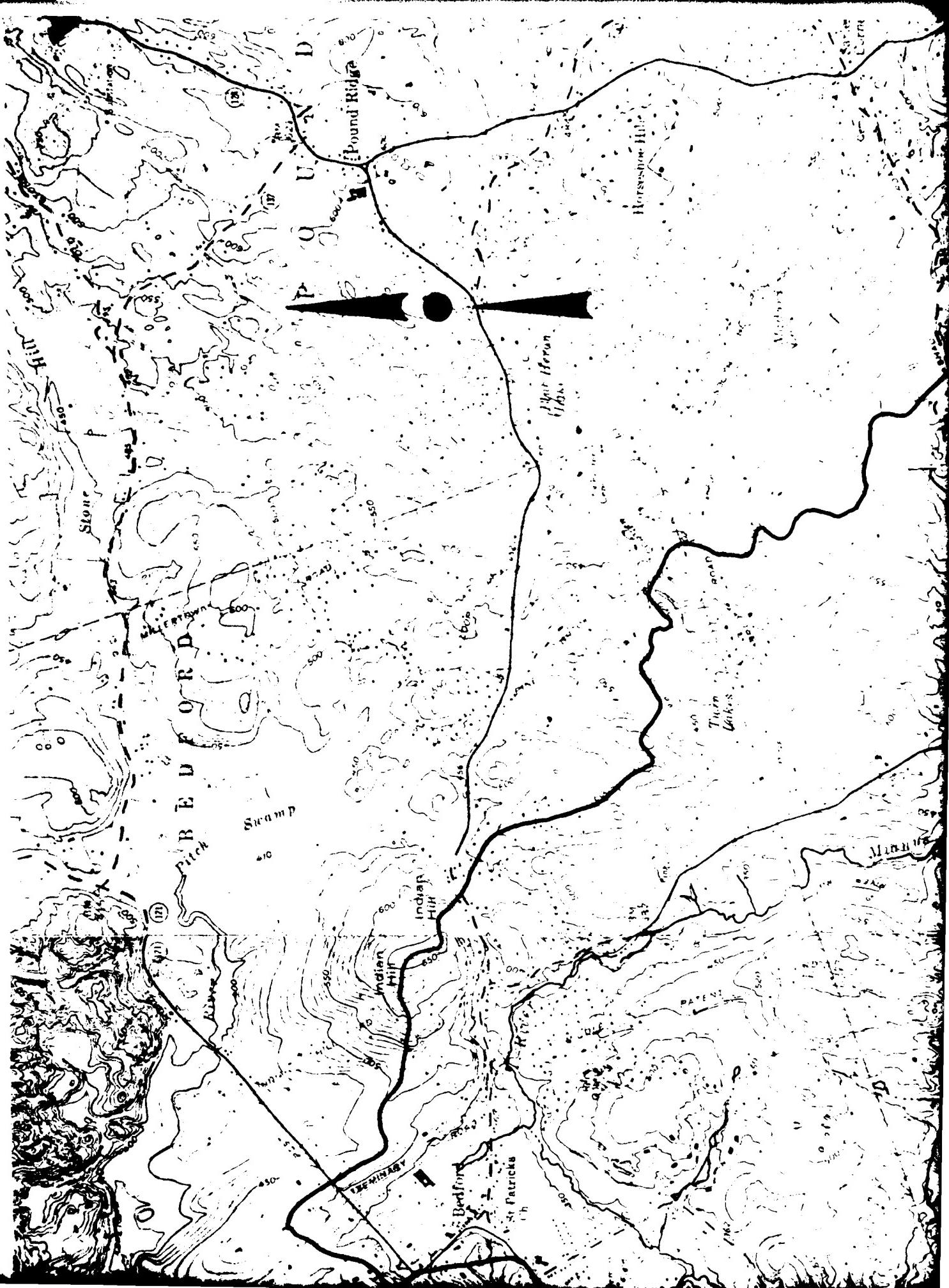
C-11 EMBANKMENT ON LEFT -
LOOKING DOWNSTREAM CHANNEL



C-12 RETAINING WALL AND BLOWOFF OUTLETS ON LEFT
BANK OF DOWNSTREAM CHANNEL - LOOKING DOWNSTREAM
CREST

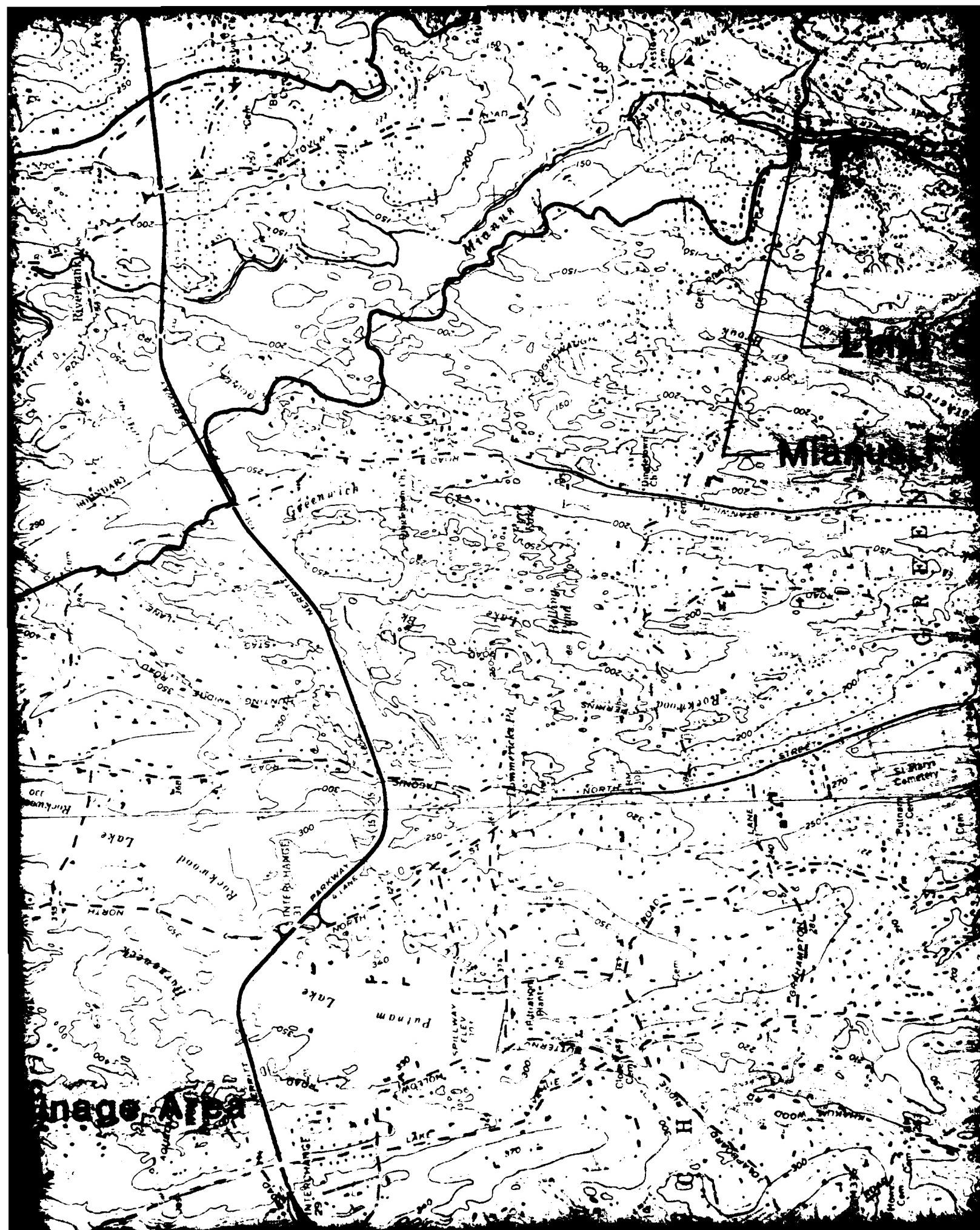
APPENDIX D

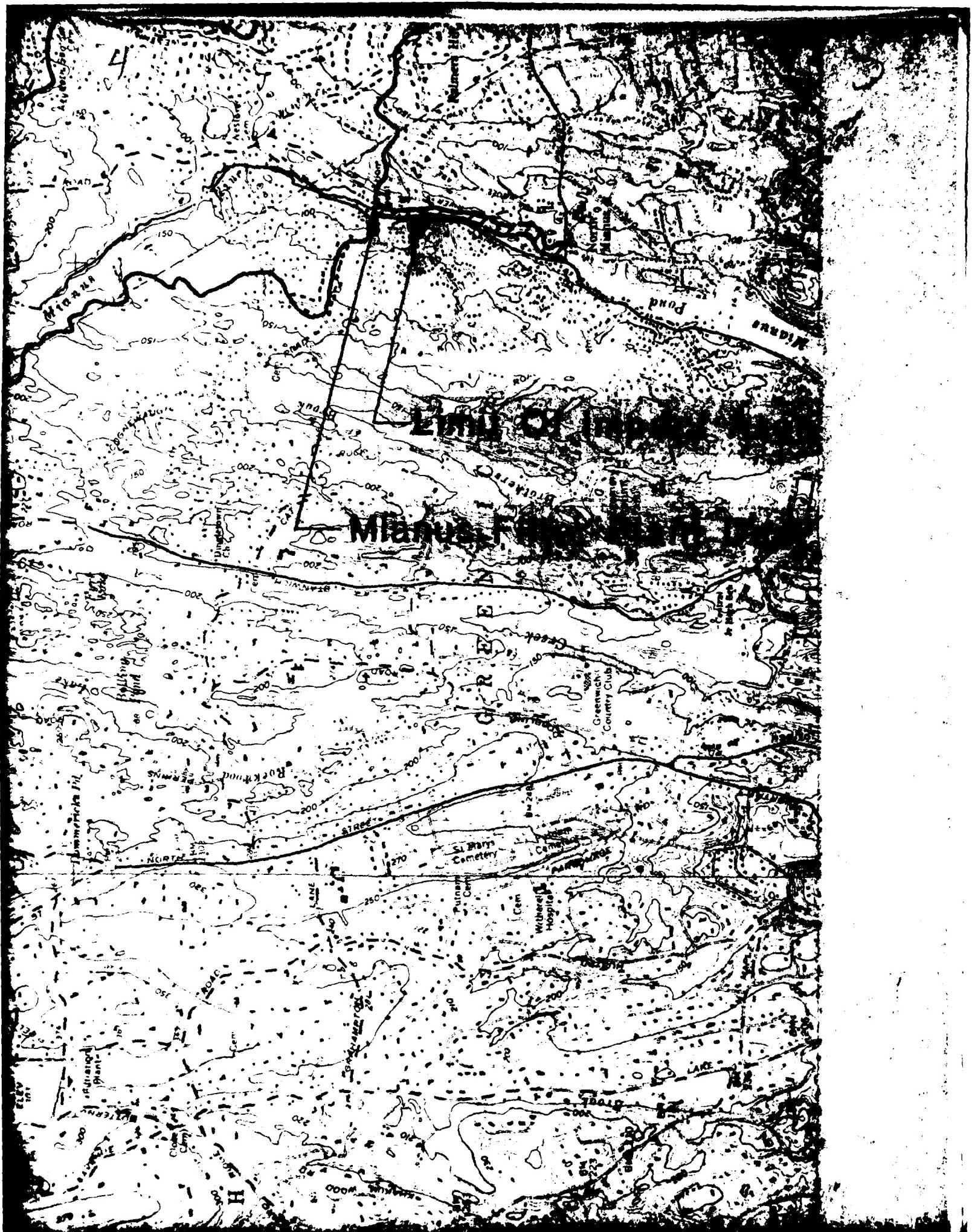
HYDROLOGIC AND HYDRAULIC COMPUTATIONS

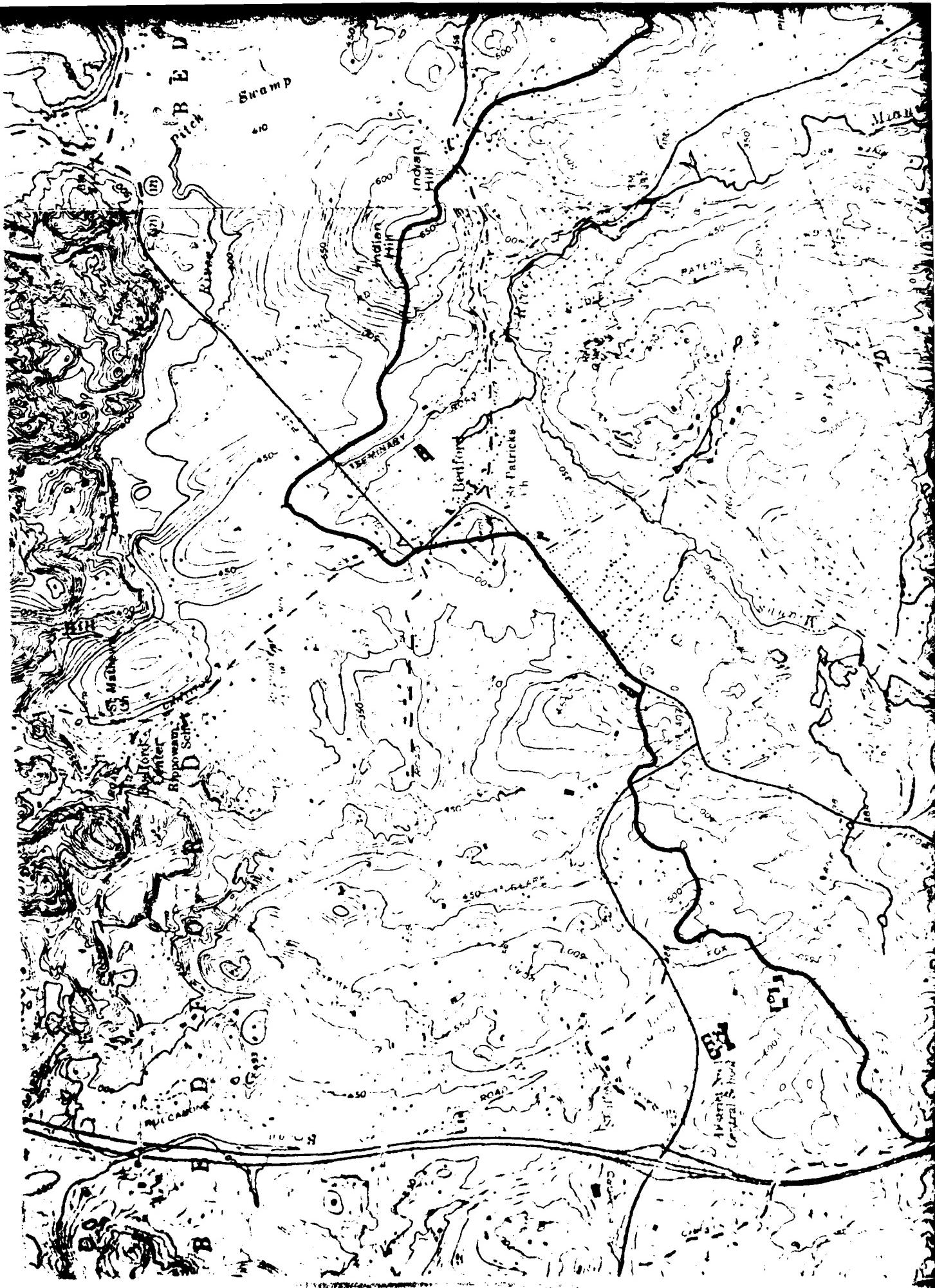




Limit Of Drainage Area

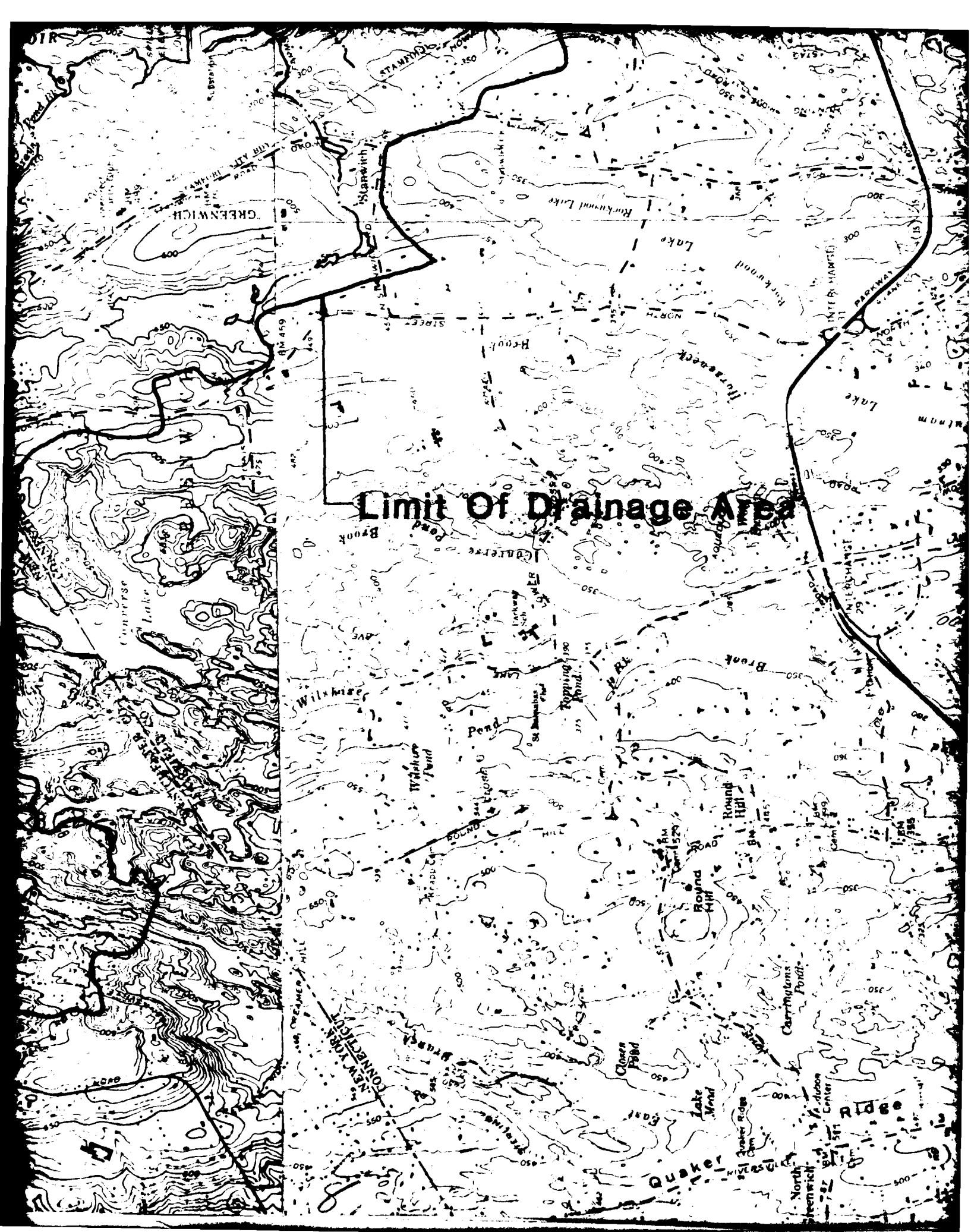


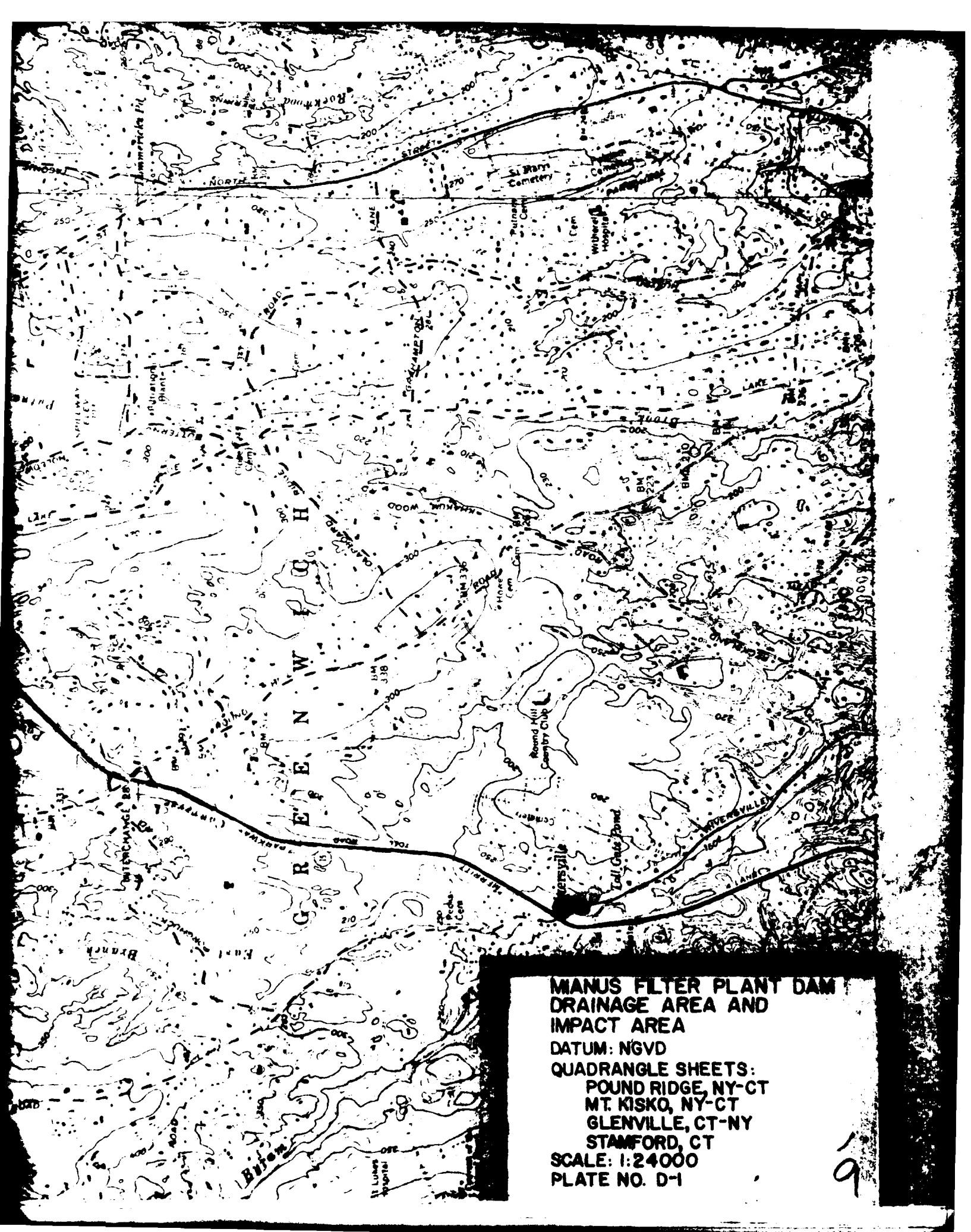






Limit Of Drainage Area





**HYDROLOGIC AND HYDRAULIC ANALYSIS
SUMMARY SHEET**

Dam Mianus Filter Plant Dam

Test Flood 1/2 PMF

INFLOW HYDROGRAPH DEVELOPMENT

Drainage Area 29.9 sq. mi.

Probable Maximum Precipitation
24 hour - 200 square mile PMP 22 inches

Initial Rainfall Loss 0 Inch
Uniform Rainfall loss .1 Inch

Snyder's Lag 7.55 hours
Snyder's Peaking Coefficient .625

Test Flood Inflow 14200 CFS

PMF Inflow 28300 CFS

RESERVOIR ROUTING AND DAM OVERTOPPING

Test Flood Outflow 14100 CFS

Spillway Capacity at Top of Dam 680 CFS
5 % of Test Flood

Flow Over Spillway at Test Flood 7650 CFS

Spillway Crest Elevation 69.65 Feet
Top of Dam Elevation 72.15 Feet (east)
Test Flood Elevation 82.2 Feet

RECORDED AND APPROVED

FINAL

BUCK HOLLOW DAM, ARKANSAS DISTRICT
DAM SAFETY INSPECTION, JULY 1974
LAST MINUTE CHECKS FOR PQ

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	A1	DATA SHEET ANALYSIS-JULY '74. 79-905/01-1-HJ																					
2	A2	DATA SHEET ANALYSIS-JULY '74. 79-905/01-1-HJ																					
3	A3	DATA SHEET ANALYSIS-JULY '74. 79-905/01-1-HJ																					
4		12-07-74 172 PROOF																					
5			7E	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6																							
7																							
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23																							

UNITS OF SUPPORT AT STATION AND WORK CALCULATIONS

WORKING HOURS
AT
STATION
TO
END OF NETWORK

مکالمہ نامہ

SAFETY ANALYST - JUNIOR POS. 14-045701-FBI
INVESTIGATION FILER & CLERK 144-5474-TC-100-N.
12-05-70

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MULTI-PLAN ANALYSIS TO BE PERFORMED

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THE MINNEAPOLIS CIVILIZATION

COMPUTATION OF BME-DEVELOPMENT OF INFLOW HYDROGRAPH

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1STAG ICMP IFCON ITAPf JPLT INAMF 1STAGE IAUTO
1 0 0 0 0 0 0 0

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COFFEE 0.00 -22

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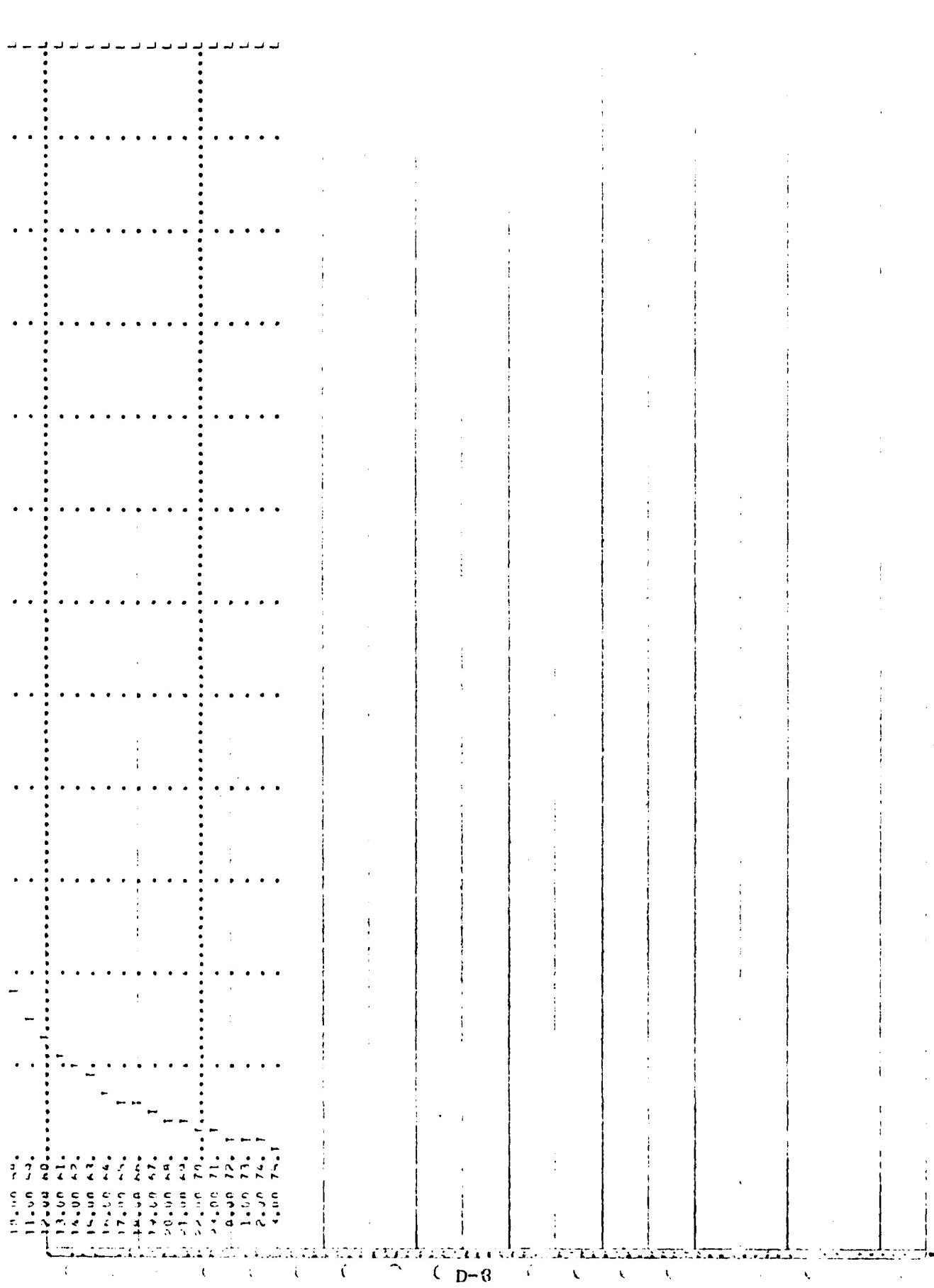
	STAMP	ULTIM	PTRIL	FMDAT	STKRS	RTDIX	STPL	CNSTL	ALSMX	RTIMP
1	0.00	0.00	1.00	0.00	0.00	1.00	0.00	0.10	0.00	0.00
2	0.00	0.00	1.00	0.00	0.00	1.00	0.00	0.10	0.00	0.00
3	0.00	0.00	1.00	0.00	0.00	1.00	0.00	0.10	0.00	0.00
4	0.00	0.00	1.00	0.00	0.00	1.00	0.00	0.10	0.00	0.00

UNIT HYDROGRAPH DATA

STATE = 1 AND UNITS = 0.01 P110P = 2.00
 STATE = 2 AND UNITS = 0.01 P110P = 6.87 INTERVALS

1000' HYDROGRAPHIC & FISHING SURVEYS. LAGE 1054 HOURS. CPB = 6.3 VOL = 1.00
1338.
73. 260. 44. 31.2. 1152. Land. 1470. 1472. 1573.
323.

	P-EAK	6-HOUR	24-HOUR	72-HOUR	TOTAL	VOLUME
CFS	2H341.	76144.	14651.	5423.	390478.	
CFS	803.	740.	415.	154.	11057.	
INCHES						
MM		8.13	14.23	2.25	20.25	
AC-FT		70.60	46.30	5.14	514.24	
THOUS. CU M		12464.	29059.	32271.	32271.	
		5394.	35344.	3905.	3905.	
						-39065.



HYDROGRAPH AT STA		1 FOH PLAN 1. RTD 1	
1.	1.	1.	0.
0.	0.	7.	76.
167.	317.	406.	217.
244.	317.	598.	218.
447.	1144.	14014.	1064.
1076.	9324.	14014.	1405.
9324.	6340.	5999.	1353.
1447.	7275.	1242.	1239.
1676.	1116.	1443.	4117.
1676.	1447.	1242.	958.
1447.	347.	244.	828.

PEAK		6-HOUR		24-HOUR		72-HOUR		TOTAL VOLUME	
CFS	14170.	13076.	7328.	2712.	19529.	5529.	5529.	406.	391.
CMS	401.	370.	207.	77.	10.12	10.12	10.12	10.12	10.12
INCHES		4.07	9.	12	26.14	257.14	257.14		
MM		103.30	231.55	267.14	16529.	16135.	16135.		
AC-FI		6442.	14529.	16529.	16529.	16529.	16529.		
THOUS CUM		7346.	17922.	19403.	19403.	19403.	19403.		

HYDROGRAPH AT STA		1 FOH PLAN 1. RTD 2	
1.	1.	1.	1.
1.	1.	4.	14.
621.	646.	707.	508.
407.	483.	875.	1197.
943.	14140.	18656.	22484.
19228.	16759.	14549.	12679.
4704.	3911.	3432.	2967.
1365.	924.	745.	644.

PEAK		6-HOUR		24-HOUR		72-HOUR		TOTAL VOLUME	
CFS	28341.	26144.	14651.	5423.	390418.	390418.	390418.	390418.	390418.
CMS	803.	740.	415.	154.	11057.	11057.	11057.	11057.	11057.
INCHES		8.13	18.23	20.25	20.25	20.25	20.25	20.25	20.25
MM		206.60	463.09	514.28	514.28	514.28	514.28	514.28	514.28
AC-FI		12964.	29059.	32271.	32271.	32271.	32271.	32271.	32271.
THOUS CUM		15991.	35844.	38805.	38805.	38805.	38805.	38805.	38805.

ISTAV	ICOMD	IFCUN	ITAPT	JPLT	JPT	TNAME	STAGE	IAUTO	IAUTO
1	1	0	ROUTING DATA	0	0	0	0	0	0
0.0	0.000	0.00	ROUTING DATA	1	1	1	1	1	1
NSTPS	NSTPL	LAI	AMSKK	X	X	TSK	STOPA	ISPRAT	ISPRAT
1	0	0	0.000	0.000	0.000	-1.	0	0	0

SURFACE AREA =

1.

1.

1.

1.

HYDROGRAPH ROUTING

PRINTING INFLOW HYDROGRAPH THRU LAKE-OVERTOPPING ANALYSIS

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The figure is a scatter plot with 'Infiltration (mm/h)' on the x-axis and 'Maximum flow (mm)' on the y-axis. Both axes range from 0 to 16000 with major tick marks every 2000 units. The data points, represented by small dots, show a clear negative correlation. A horizontal dotted line is drawn across the plot at a maximum flow value of approximately 14000 mm.

Infiltration (mm/h)	Maximum flow (mm)
1.00	11
1.00	21
1.00	31
3.00	31
4.00	41
4.00	51
4.00	61
4.00	71
7.00	71
14.00	81
9.00	91
10.00	101
11.00	111
12.00	121
13.00	131
14.00	141
15.00	151
16.00	161
17.00	171
18.00	181
19.00	191
20.00	201
21.00	211
22.00	221
23.00	231
0.00	241
1.00	251
2.00	261
3.00	271
4.00	281
5.00	291
6.00	301
7.00	311
8.00	321
9.00	331
10.00	341
11.00	351
12.00	361
13.00	371
14.00	381
15.00	391
16.00	401
17.00	411
18.00	421
19.00	431
20.00	441
21.00	451
22.00	461
23.00	471
0.00	481
1.00	491
2.00	501
3.00	511
4.00	521
5.00	531
6.00	541
7.00	551
8.00	561
9.00	571
10.00	581
11.00	591
12.00	601
13.00	611
14.00	621
15.00	631
16.00	641
17.00	651
18.00	661
19.00	671
20.00	681
21.00	691
22.00	701
23.00	711
0.00	721
1.00	731
2.00	741
3.00	751
4.00	761
5.00	771
6.00	781
7.00	791
8.00	801
9.00	811
10.00	821
11.00	831
12.00	841
13.00	851
14.00	861
15.00	871
16.00	881
17.00	891
18.00	901
19.00	911
20.00	921
21.00	931
22.00	941
23.00	951
0.00	961
1.00	971
2.00	981
3.00	991
4.00	1001
5.00	1011
6.00	1021
7.00	1031
8.00	1041
9.00	1051
10.00	1061
11.00	1071
12.00	1081
13.00	1091
14.00	1101
15.00	1111
16.00	1121
17.00	1131
18.00	1141
19.00	1151
20.00	1161
21.00	1171
22.00	1181
23.00	1191
0.00	1201
1.00	1211
2.00	1221
3.00	1231
4.00	1241
5.00	1251
6.00	1261
7.00	1271
8.00	1281
9.00	1291
10.00	1301
11.00	1311
12.00	1321
13.00	1331
14.00	1341
15.00	1351
16.00	1361
17.00	1371
18.00	1381
19.00	1391
20.00	1401
21.00	1411
22.00	1421
23.00	1431
0.00	1441
1.00	1451
2.00	1461
3.00	1471
4.00	1481
5.00	1491
6.00	1501
7.00	1511
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9.00	1531
10.00	1541
11.00	1551
12.00	1561
13.00	1571
14.00	1581
15.00	1591
16.00	1601
17.00	1611
18.00	1621
19.00	1631
20.00	1641
21.00	1651
22.00	1661
23.00	1671
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2.00	1701
3.00	1711
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5.00	1731
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19.00	1871
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1.00	1931
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3.00	1951
4.00	1961
5.00	1971
6.00	1981
7.00	1991
8.00	2001
9.00	2011
10.00	2021
11.00	2031
12.00	2041
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14.00	2061
15.00	2071
16.00	2081
17.00	2091
18.00	2101
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20.00	2121
21.00	2131
22.00	2141
23.00	2151
0.00	2161
1.00	2171
2.00	2181
3.00	2191
4.00	2201
5.00	2211
6.00	2221
7.00	2231
8.00	2241
9.00	2251
10.00	2261
11.00	2271
12.00	2281
13.00	2291
14.00	2301
15.00	2311
16.00	2321
17.00	2331
18.00	2341
19.00	2351
20.00	2361
21.00	2371
22.00	2381
23.00	2391
0.00	2401
1.00	2411
2.00	2421
3.00	2431
4.00	2441
5.00	2451
6.00	2461
7.00	2471
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9.00	2491
10.00	2501
11.00	2511
12.00	2521
13.00	2531
14.00	2541
15.00	2551
16.00	2561
17.00	2571
18.00	2581
19.00	2591
20.00	2601
21.00	2611
22.00	2621
23.00	2631
0.00	2641
1.00	2651
2.00	2661
3.00	2671
4.00	2681
5.00	2691
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19.00	3071
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23.00	3111
0.00	3121
1.00	3131
2.00	3141
3.00	3151
4.00	3161
5.00	3171
6.00	3181
7.00	3191
8.00	3201
9.00	3211
10.00	3221
11.00	3231
12.00	3241
13.00	3251
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15.00	3271
16.00	3281
17.00	3291
18.00	3301
19.00	3311
20.00	3321
21.00	3331
22.00	3341
23.00	3351
0.00	3361
1.00	3371
2.00	3381
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4.00	3401
5.00	3411
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2.00	4341
3.00	4351
4.00	4361
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6.00	4381
7.00	4391
8.00	4401
9.00	4411
10.00	4421
11.00	4431
12.00	4441
13.00	4451
14.00	4461
15.00	4471
16.00	4481
17.00	4491
18.00	4501
19.00	4511
20.00	4521
21.00	4531
22.00	4541
23.00	4551
0.00	4561
1.00	4571
2.00	4581
3.00	4591
4.00	4601
5.00	4611
6.00	4621
7.00	4631
8.00	4641
9.00	4651
10.00	4661
11.00	4671
12.00	4681
13.00	4691
14.00	4701
15.00	4711
16.00	4721
17.00	4731
18.00	4741
19.00	4751
20.00	4761
21.00	4771
22.00	4781
23.00	4791
0.00	4801
1.00	4811
2.00	4821
3.00	4831
4.00	4841
5.00	4851
6.00	4861
7.00	4871
8.00	4881
9.00	4891
10.00	4901
11.00	4911
12.00	4921
13.00	4931
14.00	4941
15.00	4951
16.00	4961
17.00	4971
18.00	4981
19.00	4991
20.00	5001
21.00	5011
22.00	5021
23.00	5031
0.00	5041
1.00	5051
2.00	5061
3.00	5071
4.00	5081
5.00	5091
6.00	5101
7.00	5111
8.00	5121
9.00	5131
10.00	5141
11.00	5151
12.00	5161
13.00	5171
14.00	5181
15.00	5191
16.00	5201
17.00	5211
18.00	5221
19.00	5231
20.00	5241
21.00	5251
22.00	5261
23.00	5271
0.00	5281
1.00	5291
2.00	5301
3.00	5311
4.00	5321
5.00	5331
6.00	5341
7.00	5351
8.00	5361
9.00	5371
10.00	5381
11.00	5391
12.00	

1.00	60.
1.00	61.
1.00	62.
1.00	63.
1.00	64.
1.00	65.
1.00	66.
1.00	67.
1.00	68.
1.00	69.
1.00	70.
2.00	70.
2.00	71.
2.00	72.
2.00	73.
2.00	74.
2.00	75.
3.00	75.

CD-12

STATION: 1. PLAN 1. RATIO 2
FALL-OF-FALLON HYDROGRAPH ORDINATES

	OUTFLOW	OUTFLOW	OUTFLOW	OUTFLOW
6.	1.	1.	1.	1.
1.	1.	1.	5.	2K.
5.	676.	705.	686.	525.
4.	454.	545.	814.	1124.
3.	16577.	16795.	20733.	24725.
2.	14063.	14601.	13457.	11615.
1.	4046.	3545.	3041.	2617.
0.	942.	921.	707.	609.

	STORAGE	STORAGE	STORAGE	STORAGE
0.	0.	0.	0.	0.
1.	0.	0.	1.	2.
2.	18.	19.	19.	16.
3.	14.	17.	21.	25.
4.	264.	412.	581.	751.
5.	416.	370.	294.	238.
6.	66.	57.	50.	45.
7.	23.	21.	19.	17.

	STAGE	STAGE	STAGE	STAGE
0.	69.7	69.7	69.7	69.7
1.	69.7	69.7	69.7	69.7
2.	60.2	60.7	60.7	60.7
3.	72.1	72.2	72.2	72.0
4.	71.4	71.6	71.4	72.5
5.	81.6	81.5	81.5	85.0
6.	83.0	82.8	82.8	85.3
7.	76.7	76.8	75.8	75.5
8.	73.1	73.2	72.6	72.0

PEAK OUTFLOW IS 27054. AT TIME 47.00 HOURS

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
GFS	27054.	25855.	14654.	5420.	390272.
CMS	792.	732.	415.	153.	11051.
INCHES		H.04	18.24	20.24	20.24
AM		204.31	463.22	514.01	514.01
AC-FT		12820.	29057.	32254.	32254.
THOUS CU M		15414.	35853.	39785.	39785.

REVIEW

STATION 1

	1000	4000	8000	12000	16000	20000	24000	28000	32000
1.00	11								
2.00	21								
3.00	31								
4.00	41								
5.00	51								
6.00	61								
7.00	71								
8.00	81								
9.00	91								
10.00	101								
11.00	111								
12.00	121								
13.00	131								
14.00	141								
15.00	151								
16.00	161								
17.00	171								
18.00	181								
19.00	191								
20.00	201								
21.00	21.01								
22.00	22.1								
23.00	23.1								
24.00	24.1								
25.00	25.1								
26.00	26.1								
27.00	27.1								
28.00	28.1								
29.00	29.1								
30.00	30.1								
31.00	31.1								
32.00	32.1								
33.00	33.01								
34.00	34.1								
35.00	35.1								
36.00	36.1								
37.00	37.1								
38.00	38.1								
39.00	39.1								
40.00	40.1								
41.00	41.1								
42.00	42.1								
43.00	43.1								
44.00	44.1								
45.00	45.1								
46.00	46.1								
47.00	47.1								
48.00	48.1								
49.00	49.1								
50.00	50.1								
51.00	51.1								
52.00	52.1								
53.00	53.1								
54.00	54.1								
55.00	55.1								

D-14

Time	Distance	Speed
0.00	61.0	
1.00	60.96	0.04
2.00	60.92	0.04
3.00	60.88	0.04
4.00	60.84	0.04
5.00	60.80	0.04
6.00	60.76	0.04
7.00	60.72	0.04
8.00	60.68	0.04
9.00	60.64	0.04
10.00	60.60	0.04
11.00	60.56	0.04
12.00	60.52	0.04
13.00	60.48	0.04
14.00	60.44	0.04
15.00	60.40	0.04
16.00	60.36	0.04
17.00	60.32	0.04
18.00	60.28	0.04
19.00	60.24	0.04
20.00	60.20	0.04
21.00	60.16	0.04
22.00	60.12	0.04
23.00	60.08	0.04
24.00	60.04	0.04
25.00	60.00	0.04
26.00	59.96	0.04
27.00	59.92	0.04
28.00	59.88	0.04
29.00	59.84	0.04
30.00	59.80	0.04
31.00	59.76	0.04
32.00	59.72	0.04
33.00	59.68	0.04
34.00	59.64	0.04
35.00	59.60	0.04
36.00	59.56	0.04
37.00	59.52	0.04
38.00	59.48	0.04
39.00	59.44	0.04
40.00	59.40	0.04
41.00	59.36	0.04
42.00	59.32	0.04
43.00	59.28	0.04
44.00	59.24	0.04
45.00	59.20	0.04
46.00	59.16	0.04
47.00	59.12	0.04
48.00	59.08	0.04
49.00	59.04	0.04
50.00	59.00	0.04
51.00	58.96	0.04
52.00	58.92	0.04
53.00	58.88	0.04
54.00	58.84	0.04
55.00	58.80	0.04
56.00	58.76	0.04
57.00	58.72	0.04
58.00	58.68	0.04
59.00	58.64	0.04
60.00	58.60	0.04
61.00	58.56	0.04
62.00	58.52	0.04
63.00	58.48	0.04
64.00	58.44	0.04
65.00	58.40	0.04
66.00	58.36	0.04
67.00	58.32	0.04
68.00	58.28	0.04
69.00	58.24	0.04
70.00	58.20	0.04
71.00	58.16	0.04
72.00	58.12	0.04
73.00	58.08	0.04
74.00	58.04	0.04
75.00	58.00	0.04
76.00	57.96	0.04
77.00	57.92	0.04
78.00	57.88	0.04
79.00	57.84	0.04
80.00	57.80	0.04
81.00	57.76	0.04
82.00	57.72	0.04
83.00	57.68	0.04
84.00	57.64	0.04
85.00	57.60	0.04
86.00	57.56	0.04
87.00	57.52	0.04
88.00	57.48	0.04
89.00	57.44	0.04
90.00	57.40	0.04
91.00	57.36	0.04
92.00	57.32	0.04
93.00	57.28	0.04
94.00	57.24	0.04
95.00	57.20	0.04
96.00	57.16	0.04
97.00	57.12	0.04
98.00	57.08	0.04
99.00	57.04	0.04
100.00	57.00	0.04

DETAILED AND STANDARD (TYPE OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLUXES IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES (SQUARE KILOMETERS)

OPERATION STATION AREA PLAN RATIO 1 RATIO 2
sq mi (sq km) cu ft sec cu ft sec

OPERATION	STATION	AREA	PLAN	RATIO 1	RATIO 2
WYOMING	WYOMING	27	20.00	1	1417.0
			(77.44)	(401.26)	(802.62)
UNITED	UNITED	26	20.00	1	1414.0
			(77.44)	(400.23)	(791.57)

SUMMARY OF DAM SAFETY ANALYSIS

PLAN	ELEVATION STORAGE OUTFLOW	INITIAL VALUE Cu.Ft.	SPILLWAY CLEAR 0.	TOP OF DAM 74.70 3 ft. 1955.	TIME OF MAXIMUM OUTFLOW OVER TOP HOURS		TIME OF MAX OUTFLOW HOURS	
					MAXIMUM DEPTH Cu.Ft.	STORAGE AC-FT	MAXIMUM OUTFLOW CFS	MAX OUTFLOW CFS
1.00	37.00	12.98	7.50	314.	14134.	27974.	24.00	47.00
				955.			30.00	47.00

MIANUS FILTER PLANT DAM

A. Size Classification

Height of dam = 31 ft.; hence Samll

Storage capacity at top of dam (elev. 72.15) = 118 AC-FT.; hence small

Adopted size classification small

B.i) Hazard Potential

This dam is located upstream of North Mianus, an urbanized area. The pond supplies water through a 24" pipe for this town.

ii) Impact of Failure of Dam at Maximum Pool (Top of Dam)

It is estimated from the rule of "thumb" failure hydrograph, that the following adverse impacts are a possibility by the failure of this dam.

- a) Loss of homes Yes 3-5 ;
- b) Loss of buildings Yes 3-5 ;
- c) Loss of highways or roads No ; ;
- d) Loss of bridges No ; ;

The failure profile can affect a distance of 4000 feet from the dam.

C. Hazard Potential Classifications

<u>HAZARD</u>	<u>SIZE</u>	<u>TEST FLOOD RANGE</u>	
<u>High</u>	<u>Small</u>	<u>1/2 PMF to PMF</u>	
Adopted Test Flood =	<u>1/2 PMF</u>	= <u>490</u>	<u>CSM</u>
		= <u>14,200</u>	<u>CFS</u>

D. Overtopping Potential

Drainage Area 19,164 Acres = 29.9 sq. miles

Spillway crest elevation = 69.65

Top of Dam Elevation = 72.15 (east)

Maximum spillway discharge

Capacity without overtopping of dam = 680 CFS

"test flood" inflow discharge = 14,200 CFS

"test flood" outflow discharge = 14,100 CFS

MIANUS FILTER PLANT DAM

Dam Failure Analysis

1. Failure discharge with pool at top of dam (elev. 72.15) = 8463 CFS
2. Depth of water in reservoir at time of failure = 28 ft.
3. Maximum depth of flow downstream of dam = @ Face 9.0 ft.
4. Water surface elevation just downstream) of dam at time of failure) = 50.5±

The failure discharge of 8463 CFS will enter and flow downstream 4000+ feet until the river enters Mianus Pond.

Valley storage in this 4000 foot length of brook is substantial in reducing the discharge. Also due to roughness characteristics, obstructions and frictional losses, it is very likely that the unsteady dam failure flow will dissipate its wave and kinetic energy and thus convert to steady and uniform flow obeying Manning's formulae 4000 feet downstream. The failure profile will have the following hydraulic characteristics:

DISTANCE FROM THE DAM	WATER SURFACE ELEVATION	REMARKS
0	72.15	Upstream of dam
0	50.5	Downstream of dam
2000'	25.0	
4000'	19.5	

Beyond 4000 feet, and into Mianus Pond, the failure discharge will flow in the below given channel characteristics:

$$Q = \underline{4582} \text{ CFS}; \quad S = \underline{.005}$$

$$n = \underline{0.05}; \quad b = \underline{150}; \quad d = \underline{4.5}$$

Side slopes = 1V or 2H.

"Rule of Thumb Guidance for Estimating
Downstream Dam Failure Analysis"

DATA

Name of Dam Mianus Filter Plant Dam
Location North of North Mianus
Drainage Area 29.9 sq. mi., Top of Dam 72.15 (east)
Spillway Type Broad Crested, Crest of Spillway 69.65
Surface Area @ Crest Elev. 7.6 Acres = 0.012 sq. mi.
Pool Bottom Near Dam = 41.5±
Assumed Side Slopes of Embankments = 2:1
Depth of Pool at Dam (Yo) = 28 Feet
Mid-Height Elev. 57.25
Length of Dam at Crest = 200 Feet
Length of Dam at Mid-Height = 171 Feet
20 % of Dam Length at Mid-Height = W_b = 34 Feet

Step 1

Storage (S) at time of failure 118 Ac-FT
(Equal to top of dam)

Step 2

$$\begin{aligned} \text{Peak Failure Discharge} \\ Q_{pl} &= 8/27 W_b \sqrt{g} Y_o^{3/2} \\ &= 1.68 W_b Y_o^{3/2} = 8463 \text{ cfs} \end{aligned}$$

Failure is assumed to coincide with pool elevation at top of dam.

AD-A142 685

NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS
MIANUS FILTER PLANT D..(U) CORPS OF ENGINEERS WALTHAM
MA NEW ENGLAND DIV FEB 80

2/2

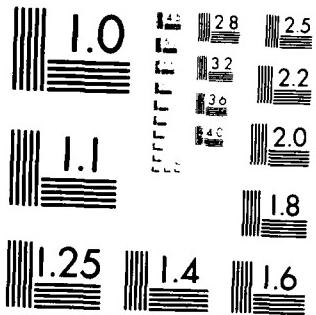
UNCLASSIFIED

F/G 13/13

NL



END
ONE PAGE FILMED
8-84
OTC



MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS

Mianus Pond is located 4000 feet downstream of Mianus Filter Plant dam. There is a 26.5 foot drop into Mianus pond which will cause the dissipation of wave and kinetic energy of the failure discharge. Approximately, the water surface elevations between the dam and Mianus pond will be as given on Dam Failure Analysis. The increase of depth in Mianus pond due to failure of Mianus Filter Plant dam is estimated to be 4.5 feet.

BY E.G. DATE 1/27/77 SUBJECT DAM INSPECTION
CHKD. BY J.R.P. DATE 1/15/77 STC'D.

SHEET NO 1 OF 3
JOB NO 17-346

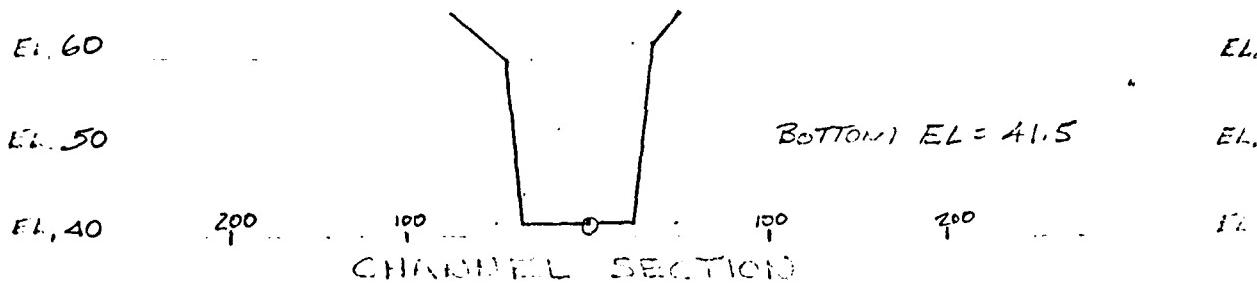
DOWNSTREAM W.S. EL. COMPUTATIONS

NAME OF DAM: MIANUS FILTER PLANT DAM

SECTION LOCATION: FACE DOWNSTREAM OF DAM

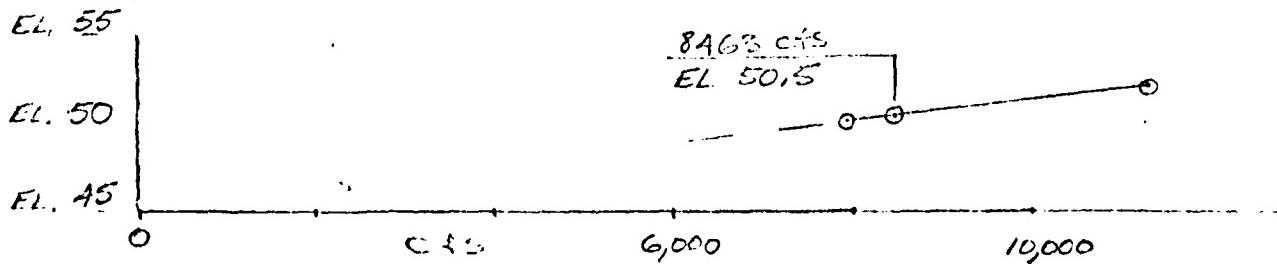
USING: $Q = 1.486/n A R^{2/3} S^{1/2}$

WHERE: $n = 0.05$ $S = \text{slope} = 0.017\frac{1}{1}$



$C_F = 8463 \text{ cfs}$ STORAGE (S) 118 AC-FT

EL.	A. (ft)	V. (ft)	F	A. (ft)	S. (ft)	C. (ft)	R. (ft)
50	553	77	7.18	3.72	.13	2272	7952
55	916	87	10.52	4.80	.13	2272	16,996
52	696	81	8.59	4.20	.13	2272	11,282



DEPTH @ DOWNSTREAM FACE OF DAM
EQUAL TO 9.0 OR EL 50.5

STAGE DISCHARGE = 8163 ELEV = 50.5 OR A.D = 9.0
NEXT DOWNSTREAM BOTTOM = 2000 FT.

PURCELL ASSOCIATES

BY E.R.C. DATE 11/22/77 SUBJECT DAM INSPECTION!
CHKD. BY E.R.L. DATE 11/22/77 STORER

SHEET NO. 2 OF 2
JOB NO. 77-905

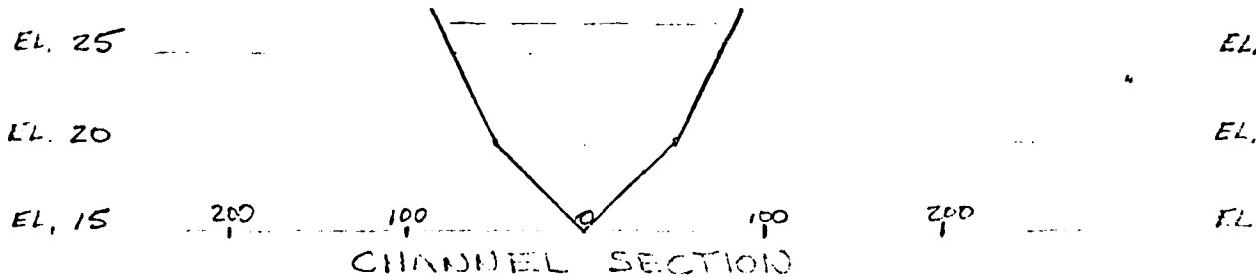
DOWNSTREAM W.S. EL. COMPUTATIONS

NAME OF DAM: MIANUS FILTER PLANT DAM

SECTION LOCATION: 2000' DOWNSTREAM OF DAM

USING: $Q = 1.486/n A R^{2/3} S^{1/2}$

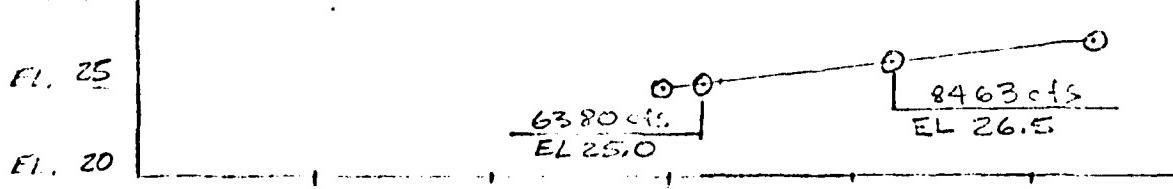
WHERE: $n = 0.05$ $S = \text{slope} = .005^{1/2}$ (ASSUMED)



$$Q_{P_1} = 8463 \quad \text{STORAGE (S)} \quad 118 \text{ AC-ft}$$

F.M.	A(FM)	WP	R	A ^{2/3}	S ^{1/2}	1.486/n	Q _P cfs	Elev. ft
20	250	100	2.5	1.84	.07	29.72	968	5
25	875	150	5.83	5.24	.07	29.72	5899	10
27.5	1281	170	7.54	3.84	.07	29.72	10,245	12.5

EL. 20



$$V_1 = \frac{9+0+11.5}{2} \times \left(\frac{70+165}{2} \times \frac{(5.39)}{2000} - 48550 \right) \frac{1}{2} = 27.6 \text{ AC-ft}$$

$$Q_{P_2} (\text{FINAL}) = Q_{P_1} (1 - \frac{V_1}{S}) = 6380 \text{ cfs}$$

$$V_2 = \frac{9+0+10.0}{2} \times 5.39 \times \frac{1}{2} = 25.6 \text{ AC-ft} \quad V_{AVE} = 26.6 \text{ AC-ft}$$

$$Q_{P_2} = Q_{P_1} (1 - \frac{V_{AVE}}{S}) = 6626 \text{ cfs}$$

STAGE DISCHARGE = 6626 cfs. ELEV = 25.0 OR A D = 10.0
NEXT DOWNSTREAM SECTION 2000' f.t. FURCELL ASSOCIATES

BY E.C.B. DATE 1/22/77 SUBJECT DOWNSTREAM INSPECTION!
CHECKED BY E.R.J. DATE 1/13/77 STAGE 11.0

SHEET NO. 3 OF 3
JOB NO. J-1-3052

DOWNSTREAM W.S. EL. COMPUTATIONS

NAME OF DAM: _____

SECTION LOCATION: 4000' DOWNSTREAM OF LHM
JUST DOWN OF PALMER'S HILL RD

$$\text{USING: } Q = 1.486/n A R^{3/2} S^{1/2}$$

$$\text{WHERE: } n = 0.05 \quad S = \text{SLOPE} = .005\%$$

EL. 25

EL.

EL. 20

EL.

EL. 15

EL.

CHANNEL SECTION

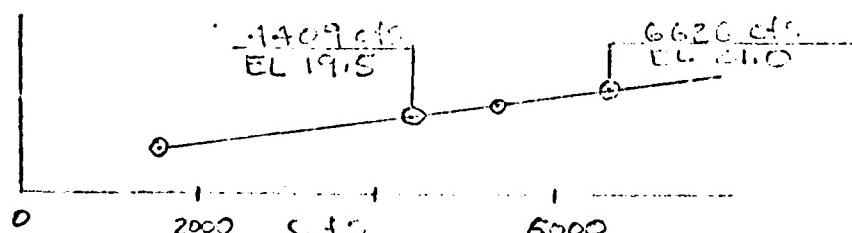
$$Q_P = 6626 \text{ cfs} \quad \text{STORAGB (S)} \quad 118 \text{ AC-ft}$$

ELEV	FISHER	W/T	R	A ^{3/2}	S/R	1.486	S	Q
17.5	444	205	2.16	1.67	.07	20.72	1546	2.5
20	1013	250	4.05	2.54	.07	20.72	5358	5.0

EL. 25

EL. 20

EL. 15



$$V_1 = \frac{10.0 + 6.0}{2} \times \left(\frac{160 + 270}{2} \times 2000 \div 18,660 \right)^{1/2} = 39.5 \text{ AC-ft}$$

$$Q_{P2}(\text{TRIAL}) = Q_{P1} (1 - V_1/S) = 4409 \text{ cfs}$$

$$V_2 = \frac{10.0 + 4.5}{2} \times \left(\frac{160 + 240}{2} \times 200 \div 18,660 \right)^{1/2} = 33.2 \text{ AC-ft} \quad V_{\text{AVE}} = 36.1 \text{ AC-ft}$$

$$Q_{P2} = Q_{P1} (1 - V_{\text{AVE}}/S) = 4582 \text{ cfs}$$

STAGE DISCHARGE = 4582 cfs ELEV = 19.5 OR A D = 1.5
NEXT DOWNSTREAM SECTN = N/LL FT

(1) PURCELL ASSOCIATES

RATING CURVE DEVELOPMENT

Mianus Filter Plant Dam

Spillway

$$Q = C L H^{2/3}$$

$$C = 2.65$$

$$L = 65 \text{ feet}$$

24 Inch Blowoff

$$Q = c a (2gh)^{1/2}$$

$$c = .6$$

$$a = 3.14 \text{ square feet}$$

Floodgates

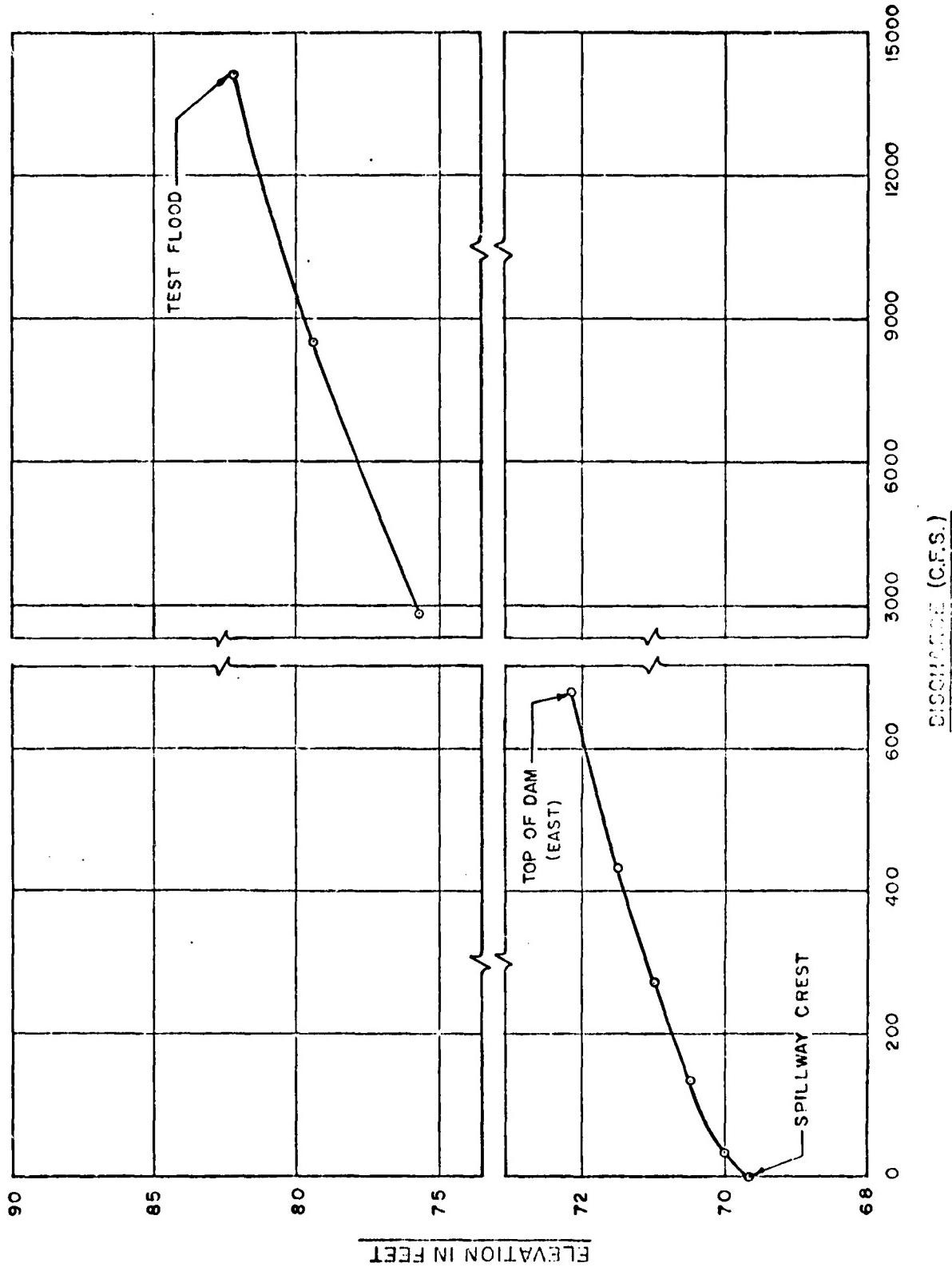
$$Q = C L H^{2/3} \text{ (unsubmerged)}$$

$$C = 2.7$$

$$L = 8 \text{ feet}$$

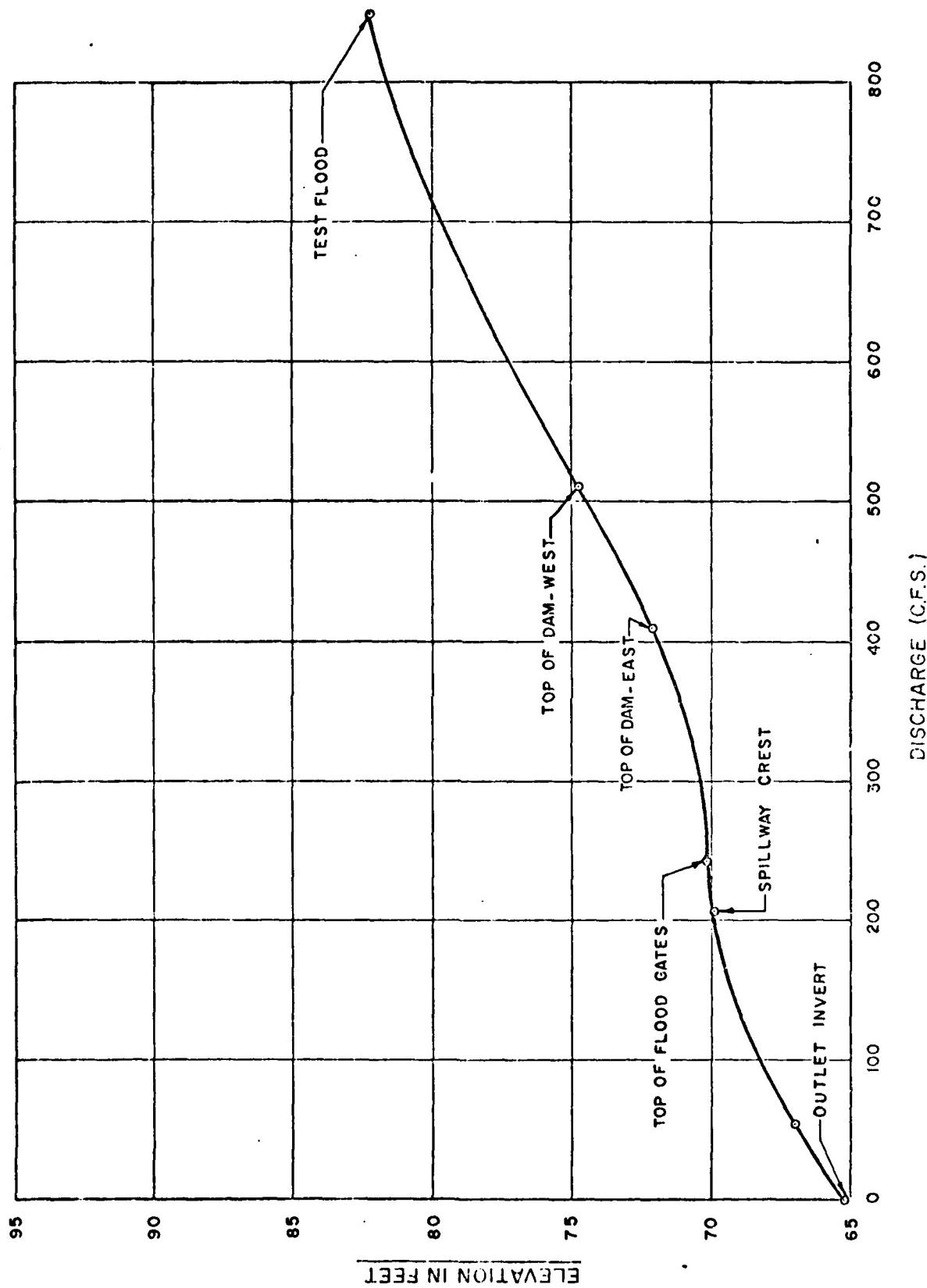
$$Q = c a (2gh)^{1/2} \text{ (submerged)}$$

$$c = 40 \text{ square feet}$$



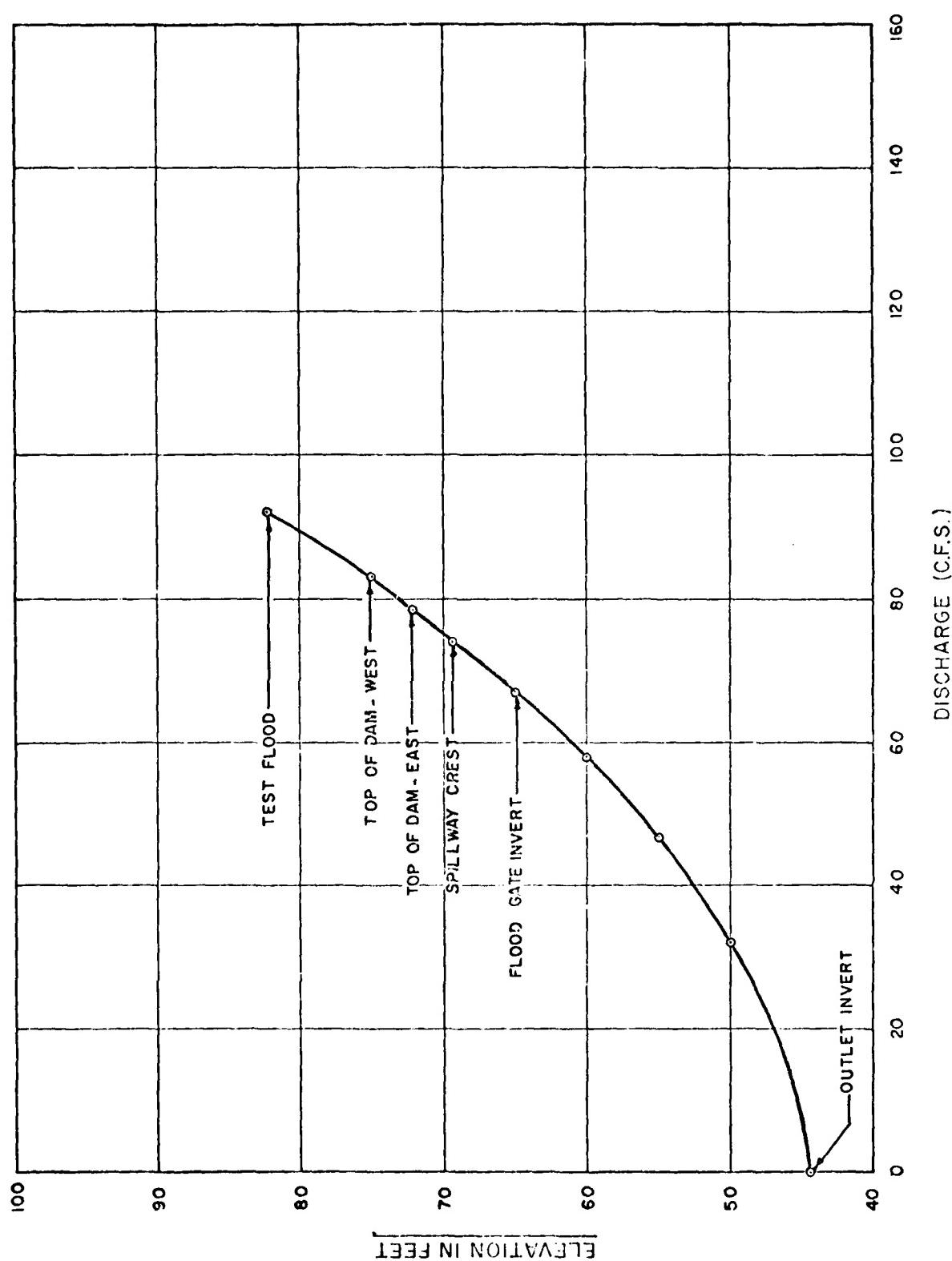
MIANUS FILTER PLANT DAM
SPILLWAY RATING CURVE

D-26



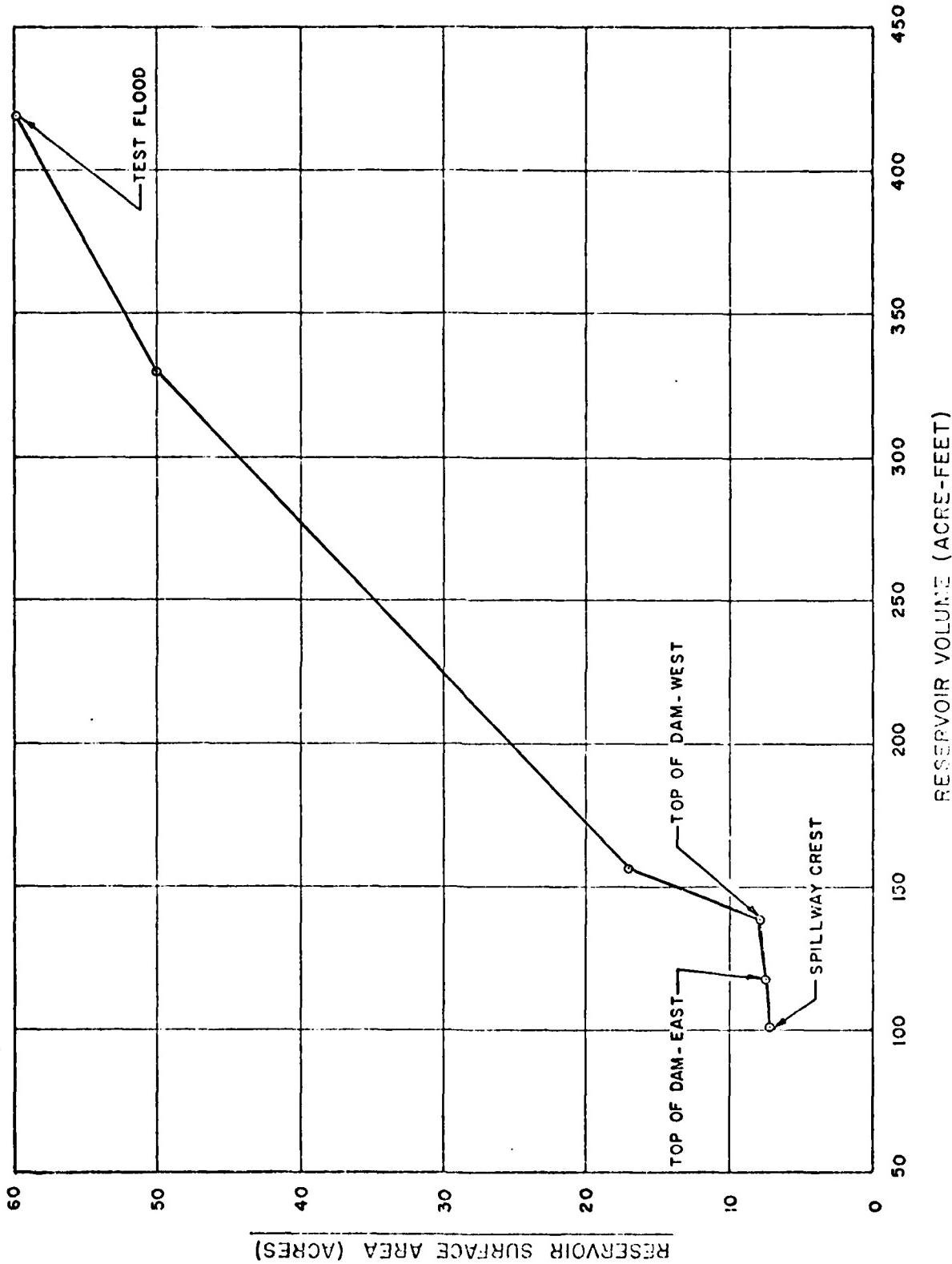
D-27

MIANUS FILTER PLANT DAM
FLOOD GATES RATING CURVE



MIANUS FILTER PLANT DAM
LOW LEVEL BLOWOFF
OUTLET WORKS RATING CURVE

D-28



D-29

MIANUS FILTER PLANT DAM
RESERVOIR AREA-CAPACITY CURVE

APPENDIX E

INFORMATION AS CONTAINED IN THE

NATIONAL INVENTORY OF DAMS

INVENTORY OF DAMS IN THE UNITED STATES

STATE NUMBER	140	NAME	REDONDAHAN	COUNTY DIST.	CT 001 04	STATE COUNTY DIST.	CT 001 04	CHARGE	CT 001 04
STATE NUMBER	40	NAME	MIANUS FILTER PLANT DAM	COUNTY DIST.		STATE COUNTY DIST.		CHARGE	

POPULAR NAME	MIANUS RIVER	NAME OF IMPOUNDMENT	MIANUS RIVER
--------------	--------------	---------------------	--------------

RIVER OR STREAM	MIANUS RIVER	NEAREST DOWNSTREAM CITY-TOWN-VILLAGE	MIANUS
YEAR COMPLETED	1975	MAXIMUM HEAD	31
TYPE OF DAM	PILOT	IMPOUNDING CAPACITIES MAXIMUM (ACRE-FT) JACQUE	31

SPILLWAY	130	MAXIMUM DISCHARGE (CFS)	65	VOLUME OF DAM (CU YD)	2100	POWER CAPACITY	0131	UN FED R PWD FED SCS A VEN DATE
OWNER	AMERICAN WATER CO	INSTALLED PROPOSED	680	IMPROVED	116	NORMAL	101	NEU N N N N N

REMARKS

21-SIENE MASONRY, 22-APPROXIMATE, MODIFIED IN 1955

SPILLWAY	130	MAXIMUM DISCHARGE (CFS)	65	VOLUME OF DAM (CU YD)	2100	POWER CAPACITY	0131	UN FED R PWD FED SCS A VEN DATE
OWNER	AMERICAN WATER CO	INSTALLED PROPOSED	680	IMPROVED	116	NORMAL	101	NEU N N N N N

REGULATORY AGENCY	CONSTRUCTION	OPERATION	Maintenance
DESIGN	CONSTRUCTION	CT DEPT ENVIR PHOT	CT DEPT ENVIN PROJ

INSPECTION BY	INSPECTION DATE	AUTHORITY FOR INSPECTION
JAMES P PUMCELL ASSOCIATES INC	DAY NO YR	13NOV79

REMARKS	47-1955 MODIFICATIONS ONLY
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**DATE
ILME**